

Appendix C

Route Refinement Report

San Juan Basin
ENERGY CONNECT



ROUTE REFINEMENT REPORT

Submitted to:
Tri-State Generation and Transmission Association, Inc.
1100 W. 116th Ave.
Westminster, CO 80234

June 2011

Contents

	Page
1.0 Introduction	1
1.1 Tri-State Generation and Transmission Association	1
1.2 Purpose of the Route Refinement Report.....	1
2.0 Purpose and Need of the Project.....	2
2.1 Project Components.....	2
2.1.1 Kiffen Canyon Substation.....	5
2.1.2 Proposed Structures.....	5
3.0 Route Selection Process	11
3.1 Macro Corridor Study	12
3.1.1 Definition of the Study Area.....	12
3.1.2 Resource Data Collection and Evaluation	13
3.1.3 Opportunities and Constraints Analysis.....	13
3.1.4 Identification of Preliminary Corridors.....	15
3.2 Scoping Meetings.....	16
3.3 Routing Objectives	21
3.4 Data and Field Review	22
3.4.1 River Crossings.....	29
3.5 Agency and Stakeholder Meetings.....	29
3.6 Preliminary Route Segments.....	33
3.7 Route Refinement Workshops.....	33
3.8 Selection of Preliminary Preferred Alternative.....	41
3.8.1 Field Reconnaissance and Meetings.....	41
3.8.2 Comparative Route Segment Matrix	42
3.8.3 Preliminary Alternative Routes	42
3.9 Comparative Alternative Matrix and Identification of Preferred Alternative.....	47
3.9.1 Scoping Meetings.....	47
4.0 Description of the Preferred and Alternative Routes	48
4.1 Description of Preferred Alternative.....	51
4.2 Description of Alternatives.....	52
4.2.1 Alternative A.....	52
4.2.2 Alternative B.....	55
4.2.3 Alternative C.....	55
4.2.4 Alternative D.....	56
4.2.5 Alternative E.....	56
4.2.6 Alternative F	57
5.0 Summary.....	58

Appendices

Appendix A:	Corridor and Route Modification Descriptions
Appendix B:	Resource Maps
Appendix C:	BLM Corridor and Route Segment Comments—June 2010
Appendix D:	Comparative Route Segment Matrix
Appendix E:	Comparative Route Matrix

Figures

Figure 2.1-1:	Study Area	3
Figure 2.1-2:	Alternative Substation Siting Locations	7
Figure 2.1-3:	Proposed Transmission Structures	9
Figure 3.0-1:	Route Selection Process	11
Figure 3.1-1:	Composite Map	17
Figure 3.1-2:	Composite Map Showing Preliminary Alternative Corridors	19
Figure 3.3-1:	Corridor Segment Modifications	23
Figure 3.4-1:	River Crossing Alternatives	31
Figure 3.6-1:	Preliminary Route Segments	35
Figure 3.7-1:	Route Segments Presented to the Public—September 2010	37
Figure 3.7-2:	Route Refinement Workshop Modifications	39
Figure 3.8-1:	Preliminary Route Segment Modifications	43
Figure 3.8-2:	Preferred and Alternative Routes	45
Figure 4.1-1:	Preferred Route	53

Tables

Table 2.1-1:	Typical Design Characteristics of the Proposed Transmission Structures	5
Table 3.0-1:	Route Selection Process Public Meeting Summary	11
Table 3.1-1:	Project Opportunity and Constraints Criteria	14
Table 3.3-1:	Routing Objective for the San Juan Basin Energy Connect Project	21
Table 4.0-1:	Summary of Potential Impacts and Important Routing Data.....	48
Table 4.1-1:	Highlights of Preferred Alternative.....	51
Table 4.2-1:	Highlights of Alternative A	52
Table 4.2-2:	Highlights of Alternative B	55
Table 4.2-3:	Highlights of Alternative C	56
Table 5.2-4:	Highlights of Alternative E	57
Table 4.2-5:	Highlights of Alternative F	57

This page intentionally left blank.

1.0 Introduction

Tri-State Generation and Transmission Association (Tri-State) is proposing to construct the San Juan Basin Energy Connect (Project), an approximate 70-mile 230 kilovolt (kV) transmission line from the Farmington area in northwestern New Mexico to Ignacio, Colorado. A new 230kV Kiffen Canyon Substation at a location north of the city of Farmington's Glade Switching Station is also proposed to be constructed as part of the Project. This line and supporting electrical facilities are needed to provide the power delivery infrastructure for the San Juan Basin to relieve transmission constraints, serve new loads, and offer economic development opportunities through renewable energy expansion.

1.1 Tri-State Generation and Transmission Association

Tri-State is a wholesale electric power supplier owned by the 44 electric member distribution systems that it serves. Tri-State generates and transports electricity to its member systems throughout a 200,000-square-mile service territory in Colorado, Nebraska, New Mexico, and Wyoming. Tri-State owns, operates, and maintains an extensive transmission system in these four states consisting of more than 5,200 miles of transmission lines, 135 substations, and numerous switchyards.

Serving approximately 1.5 million consumers, Tri-State was founded in 1952 by its member systems to provide a reliable, cost-based supply of electricity. Tri-State is headquartered in Westminster, Colorado, and employs nearly 1,200 people throughout its four-state service area.

1.2 Purpose of the Route Refinement Report

Tri-State is requesting right-of-way (ROW) grants from the Bureau of Land Management (BLM) and the Bureau of Indian Affairs (BIA), as well as financial assistance from the Rural Utilities Service (RUS), for the Project. The Western Area Power Administration (Western) is also a cooperating agency due to a need to connect to the Western-owned Shiprock Substation. Prior to making a decision to act on the requested action, federal agencies including the BLM, BIA, RUS, and Western, are required to conduct review under the National Environmental Policy Act (NEPA), Section 106 of the National Historic Preservation Act (NHPA), and Section 7 of the Endangered Species Act (ESA) in accordance with federal agency policies and procedures. The BLM is the lead federal agency for NEPA, NHPA, and ESA review and compliance. The BIA, RUS, Western, and the Southern Ute Indian Tribe are cooperating agencies in these processes.

Tri-State has followed a thorough routing and environmental review process in an effort to minimize impacts to land use and natural or cultural resources. This Route Refinement Report documents the process used to develop route alternatives for the Project from the Macro Corridor phase to the identification of the preliminary preferred and alternative routes proposed for consideration for analysis in the Environmental Impact Statement (EIS) that will be prepared by the BLM.

2.0 Purpose and Need of the Project

The purpose and need for the Project is to relieve transmission constraints, improve the power delivery infrastructure, and serve growing and new electric loads. As described below, the Project would also achieve the following objectives:

- Improve electric reliability
- Increase the load-serving capabilities for residential, small business and industrial electric consumers (including oil and gas developers)
- Provide a pathway for potential renewable energy development

Increasing electric load growth in the San Juan Basin region of Colorado and New Mexico in the commercial, residential, and industrial sectors has put a strain on the existing electrical system. Although the existing generation resources throughout the region are adequate to meet load growth, additional transmission facilities are needed to ensure that power can be delivered reliably. An added benefit of this new transmission line and substation is that new renewable energy developments could more easily interconnect to the power grid.

Tri-State, its member co-operative La Plata Electric Association, and other regional utilities have been making improvements and additions to the electric system in the San Juan Basin over the years to maintain reliability. While improvements to the local system have helped, the need to import more power into the region to meet the needs of growing communities has resulted in the proposal to construct this 230kV transmission line.

Most of the infrastructure in the region was originally built in the 1950s and, over the years, aging equipment has been replaced and upgraded. Numerous investments have been made in the transmission system and at substations throughout the region to improve reliability by building in redundant systems, installing voltage support mechanisms, and increasing capacity. The transmission path in the region is still constrained, however, and Tri-State must ensure that it meets the needs of its member systems, as well as comply with numerous federal mandatory reliability standards.

2.1 Project Components

The Project is generally located between Townships 30 and 33 North, Ranges 16 through 7 West, New Mexico Principal Meridian, San Juan County, New Mexico, and La Plata County, Colorado. The study area extends from within 1 mile of Farmington, New Mexico, and within 3 miles of the Navajo Nation, to within 5 miles of Durango, Colorado. The study area covers approximately 174,096 acres of mixed federal, state, Tribal, and private lands. The BLM Farmington Field Office and BIA manage the federal lands in the study area (Figure 2.1-1). The Project consists of the following components:

- Expansion of the existing Shiprock Substation to accommodate the new 230kV transmission line termination and installation of additional 345/230kV transformation equipment
- Approximately 30 miles of new double-circuit 230kV transmission line from the existing Shiprock Substation to the proposed Kiffen Canyon Substation near the city of Farmington's Glade Switching Station

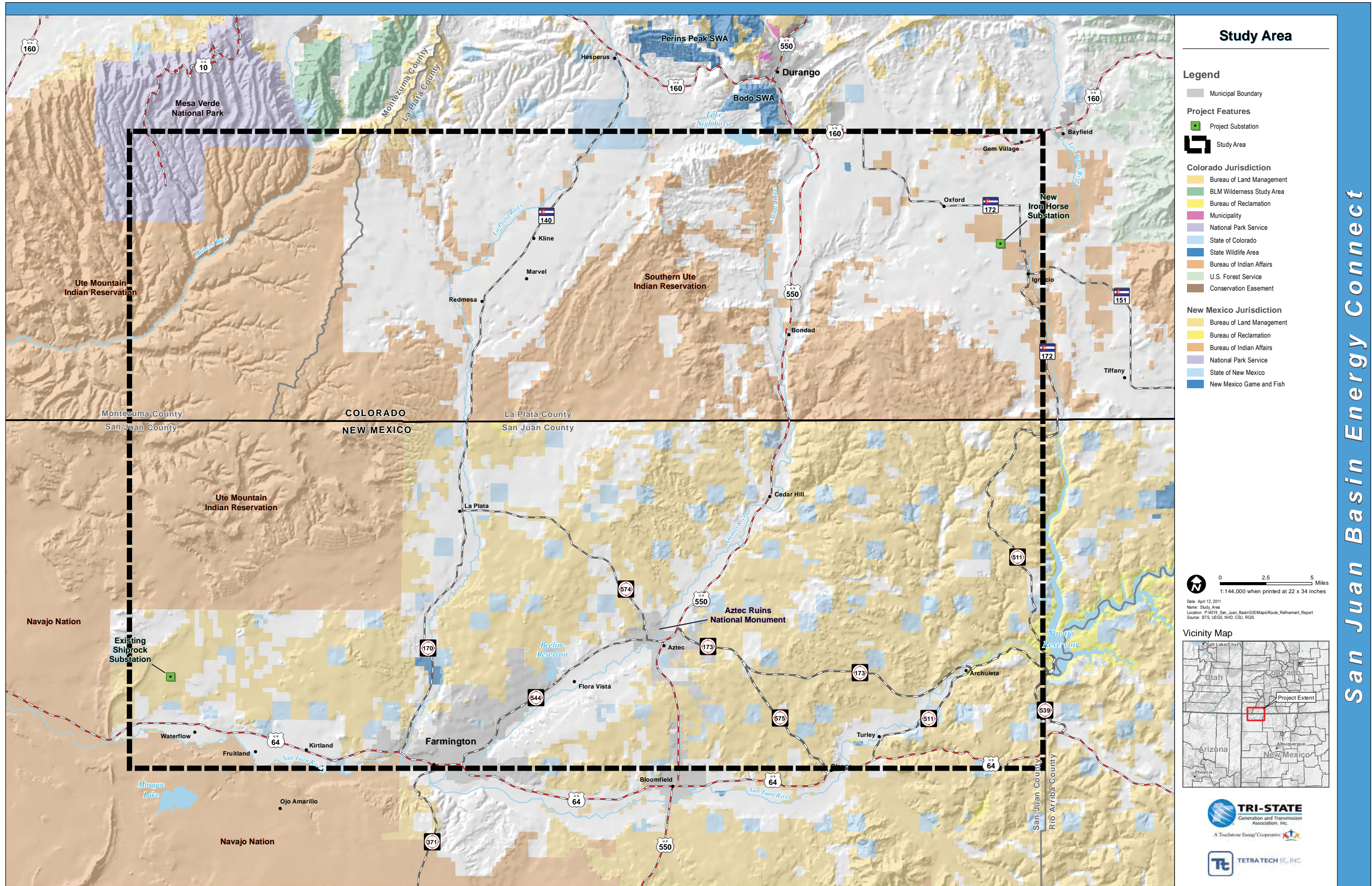


Figure 2.1-1: Study Area

- Approximately 40 miles of new double and single-circuit 230kV transmission line between the proposed Kiffen Canyon Substation and the new Iron Horse Substation
- Expansion of the Iron Horse Substation to have termination equipment for the 230kV transmission line and transformation equipment to step the 230kV voltage down to 115kV for interconnection to the area's transmission facilities
- Communication facility to support operation and maintenance of the transmission line

2.1.1 Kiffen Canyon Substation

When the need for the Project was identified by system planners, the need for a new substation north of the existing city of Farmington Glade Switching Station was also identified. The siting area for this new substation, the Kiffen Canyon Substation, was identified north of the Glade Switching Station and extends to an area that is just south of the Colorado/New Mexico state line (Figure 2.1-2). Based on a desktop analysis of the siting area and during field reconnaissance efforts that are described later in this document, the siting area was further refined and five potential substation locations were identified by the Project team. Three of the potential substation locations are in close proximity to the Glade Switching Station on BLM-managed land and state of New Mexico-owned land. The other two potential substation locations are on the northern end of corridor segment I and are on privately owned and BLM-managed land. Ultimately, the final location of the substation will be dependent on the final route selected for the transmission line. During the routing process, it was important to identify route segments that connected to the Kiffen Canyon Substation siting area.

2.1.2 Proposed Structures

Tri-State is proposing to use a combination of steel lattice structures, steel monopoles, and wood H-frame structures. The choice of structure type would be dependent on location and design conditions (e.g., mountainous versus flat terrain or double- versus single-circuit construction). The new transmission line, regardless of structure type, is expected to require a 150-foot ROW. The transmission line would use low-corona hardware to minimize audible noise. Typical design characteristics for the transmission structures proposed for the Project are listed in Table 2.1-1. Diagrams of the proposed transmission structures are presented in Figure 2.1-3. Specific structure locations have not yet been identified.

Table 2.1-1:
Typical Design Characteristics of the Proposed Transmission Structures

Voltage	Double-Circuit 230kV		Single-Circuit 230kV
Design Component	Steel Lattice Structure	Steel Mono-Pole Structure	Wood H-Frame Structure
Typical Distance Between Structures	800–1,200 feet	800–1,200 feet	800–1,100 feet
Typical Structure Height	100–150 feet	100–150 feet	65–100 feet
Typical Structures per Mile	4–6	4–6	4–7
Ground Clearance (beneath conductor under maximum operating conditions) ¹	28 feet	28 feet	28 feet
Minimum Clearance of Equipment to Energized Conductor ¹	14 feet	14 feet	14 feet
Typical Right-of-Way Width	150 feet	150 feet	150 feet

¹ Clearances would be maintained in accordance with the National Electric Safety Code.

This page intentionally left blank.

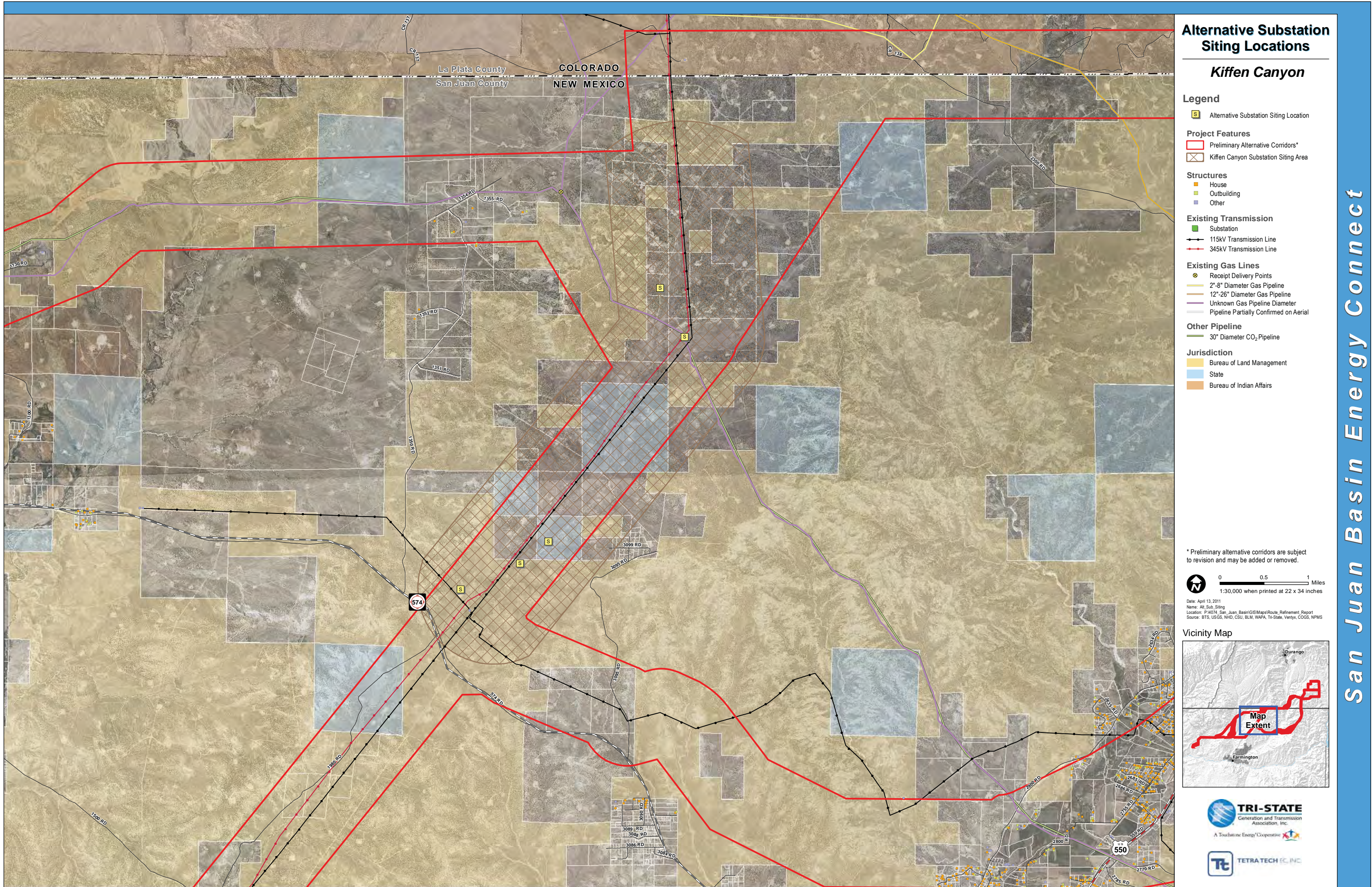


Figure 2.1-2: Alternative Substation Siting Locations

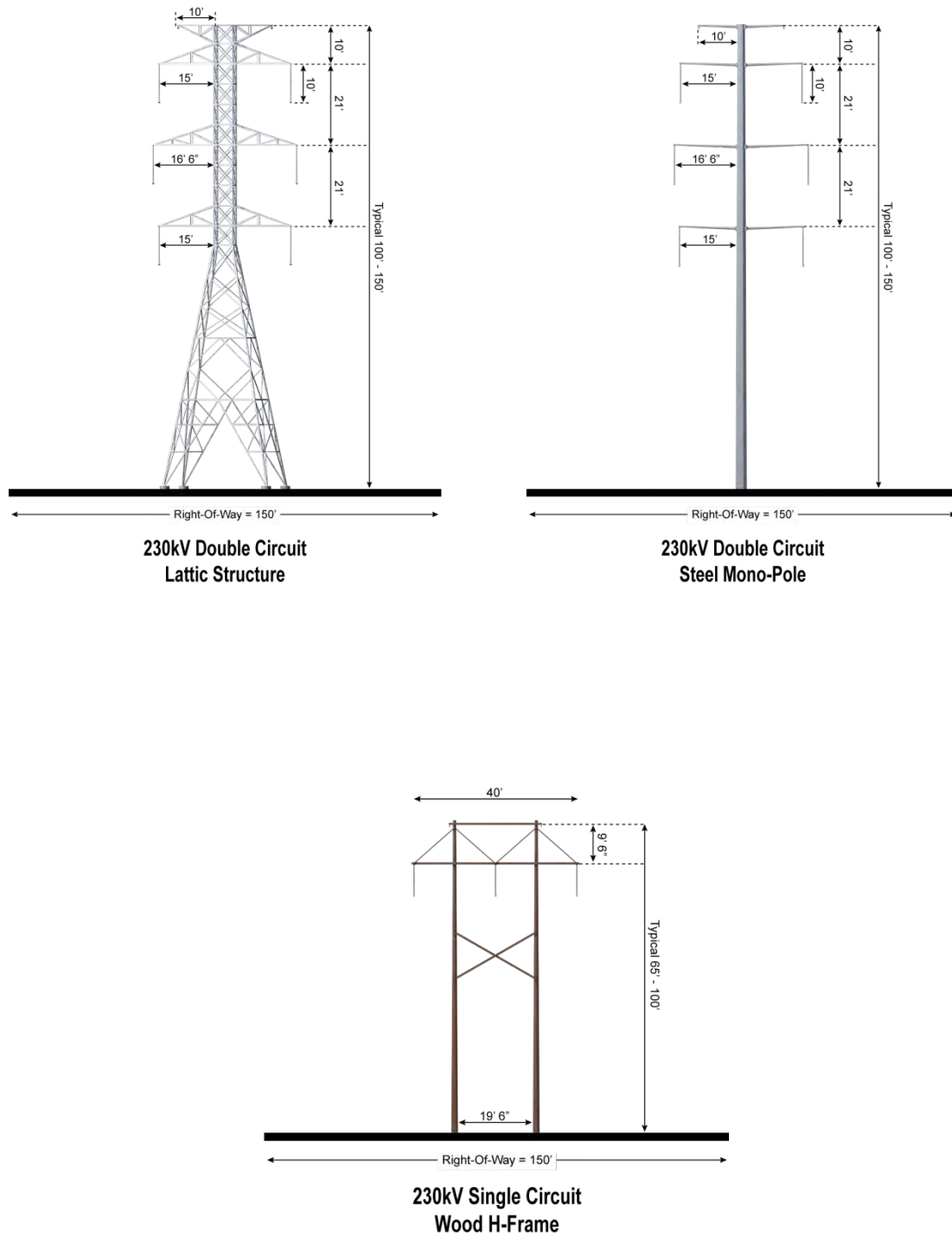


Figure 2.1-3: Proposed Transmission Structures

This page intentionally left blank.

3.0 Route Selection Process

Routing new transmission lines requires an open and comprehensive process that balances various factors including electric system planning, economics, the natural, cultural, and environment, public involvement, regulatory requirements, land rights, and engineering. The route selection process for the Project was carried out by utilizing a multi-phase, multi-step approach as shown in Figure 3.0-1.

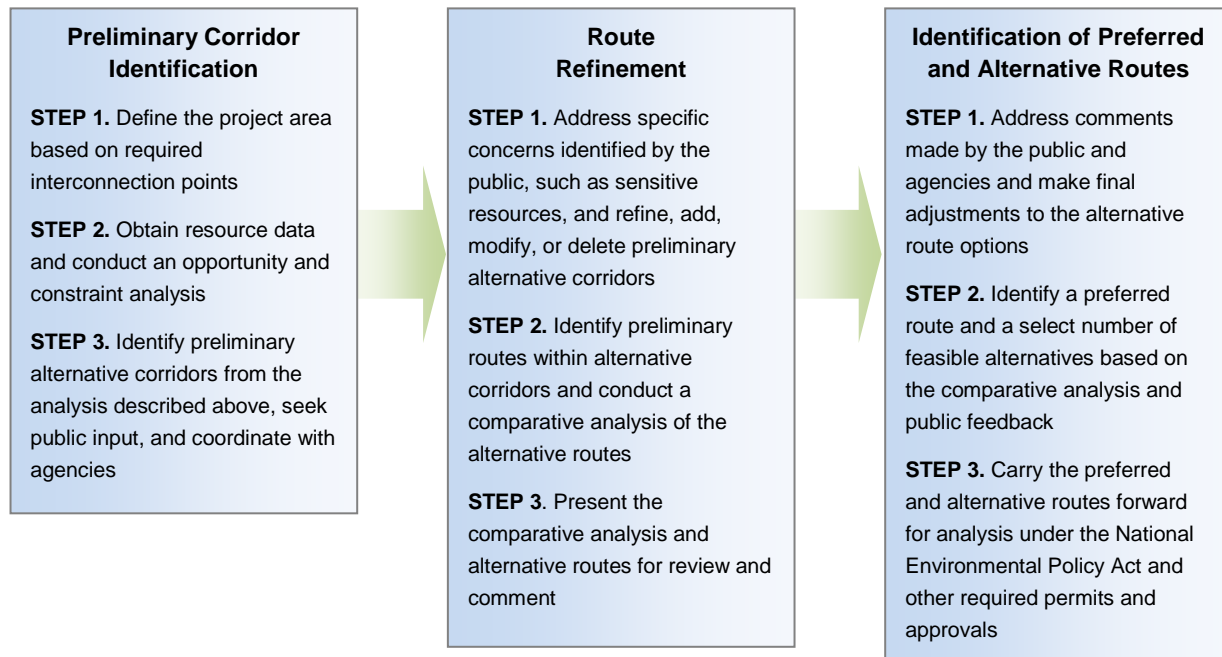


Figure 3.0-1: Route Selection Process

The route selection process began in May 2009 with a Macro Corridor Study (MCS), and has continued through the public scoping meetings for the EIS held in March 2011. Each phase of the route selection process had a defined outcome and concluded with meetings and request for public input as outlined below in Table 3.0-1.

Table 3.0-1:
Route Selection Process Public Meeting Summary

Phase	Time Period	Outcome
Preliminary Corridor Identification (MCS) Public scoping meetings for an Environmental Assessment	May 2009 to November 2009	<ul style="list-style-type: none"> Identified 1-mile-wide wide corridors within a study area Collected public and agency input, informed decision to complete an EIS instead of an Environmental Assessment

Table 3.0-1:
Route Selection Process Public Meeting Summary

Phase	Time Period	Outcome
Preliminary Route Identification Route Refinement Workshops	December 2009 to September 2010	<ul style="list-style-type: none">• Identified 48 route segments that were combined to make preliminary routes• Preliminary routes presented to the public for review and input and several route segments were modified, removed from consideration, or added
Identification of Preliminary Preferred and Alternatives Public scoping meetings for EIS	October 2010 to March 2011	<ul style="list-style-type: none">• Identified a Preliminary Preferred Alternative route and five preliminary alternatives to share with the public during scoping meetings• Collected public and agency input to assist in the development of the scope of the EIS and the development of alternatives that may be analyzed in the EIS

Sections 4 and 5 describe in more detail the steps within each phase that were used to identify the preferred and alternative routes proposed to be considered for evaluation in the EIS.

3.1 Macro Corridor Study

In May 2009, an MCS was completed by Ecosphere on behalf of Tri-State to identify potential corridors within the study area that would be feasible for transmission line development. As a result of this study, 36 corridor segments were identified. These corridors were approximately 1 mile wide, and the majority were identified because they follow existing linear features including transmission lines, roads, and natural gas pipelines.

The corridor identification process followed three steps; definition of the study area, resource data collection and evaluation, and an opportunities and constraints analysis. These steps, as performed by Ecosphere, are described in the sections that follow.

3.1.1 Definition of the Study Area

The study area was determined by the purpose and need for the Project: studies conducted by Tri-State indicated that a transmission line between the area of Farmington, New Mexico, and the area of Ignacio, Colorado, was needed to meet system demands. Based on these endpoints, the study area was then defined in a way such that it would allow adequate area to identify multiple corridors that would be feasible for transmission line development. The study area includes portions of San Juan County in New Mexico and La Plata and Montezuma counties in Colorado, shown on Figure 2.1-1.

3.1.2 Resource Data Collection and Evaluation

Data were obtained from municipalities, counties, agencies, and utilities to identify resources within the study area. Resource data that were collected to be used as part of the MCS included data with regard to resources within the following categories:

- Land Use and Ownership
- Existing Linear Transportation and Utility Corridors
- Water Resources
- Agricultural Resources
- Cultural Resources
- Biological Resources
- Geology and Soils
- Public Use Facilities

3.1.3 Opportunities and Constraints Analysis

Data within each of the resource categories listed above were reviewed and classified as either opportunities or constraints depending upon whether they had characteristics that would be compatible with the development of a transmission line, or whether they had characteristics that would limit the development of a transmission line, respectively.

Opportunity areas are identified as those areas or linear features that are compatible with transmission line development such as transmission lines, gas pipelines, roads, and West-Wide Energy Corridors. Two types of constraint areas were identified: avoidance areas and exclusion areas. Avoidance areas included those areas in which transmission line development could potentially result in environmental impacts or land use conflicts. Generally, impacts in these areas can be mitigated through route refinement and careful placement of transmission line structures. Exclusion areas are resources with the highest level of sensitivity, including areas with regulatory or legislative designations or physical characteristics that are not compatible with transmission line construction, operation, and maintenance. Development of a transmission line in these areas may result in increased environmental impacts, higher construction and permitting costs, and/or additional regulatory approvals.

Table 3.1-1 identifies the opportunity and constraints criteria developed to identify transmission line corridors. A geographic information system (GIS) model was developed to map these opportunities and constraints within the study area as shown in Figure 3.1-1.

Table 3.1-1:
Project Opportunity and Constraints Criteria

Resource	Opportunity	Avoidance	Exclusion
Land Use and Jurisdiction			
Farmland	Rangeland, agriculture		Center pivot or side role irrigation systems
Urban Areas and Subdivisions	—	—	Incorporated and unincorporated municipal boundaries (except on either side of an existing transmission line), platted subdivisions
Residences	—	Within 500 feet of an occupied residence	Within 100 feet of an occupied residence
Airports	—	—	Within approach/departure surface (10,000 feet—public, 5,000 feet—private) of an airport runway
Communication/Radio Towers (Federal Communications Commission [FCC] structures)	—	Within 150 feet of FCC structure	Within 50 feet of FCC structure
Oil and Gas Wells	—	—	Within 50 feet of well pad boundary
Schools, Parks and Recreation Areas	—	Within 0.25 mile	Within 100 feet
Restricted Land Designations	—	—	Within boundary of formally designated state lands (conservation areas, state parks, State Wildlife Area [SWAs], etc.) and national parks/landmarks/monuments
Areas of Critical Environmental Concern (ACEC)	—	—	Within boundary of federally designated ACEC, except on either side of an existing transmission line
Colorado Natural Heritage Program Potential Conservation Areas	—	Within boundary	—
Surface Mines	—	Within 500 feet of surface mine boundary	—
Coal mine lease areas	—	At appropriate locations within area of known subsidence*	—
Existing Transportation and Utility Corridors			
Roads (interstate, state, county)	Within 0.25 mile of road	Within 0.25 mile of scenic byway (except area 100 feet on either side of an existing transmission line)	—
Transmission Lines	Within 0.50 miles of existing transmission line (69kV, 115kV, 230kV, 345kV)	—	—
Pipelines (water, natural gas, oil and CO ₂)	Within 0.5 miles of existing pipeline ROWs	—	—

Table 3.1-1:
Project Opportunity and Constraints Criteria

Resource	Opportunity	Avoidance	Exclusion
Water Resources			
Surface Water	—	Within 0.125 mile of lakes and perennial streams	Within 100 feet of lakes and perennial streams
Canals/Ditches	Within 100 feet of a canal or ditch	—	—
Wetlands	—	—	Within boundary
Springs	—	—	Within 100 feet of springs
Cultural Resources			
National Register of Historic Places	—	Within 0.125 mile	Within 100 feet
Traditional Cultural Properties	—	—	Within 0.125 mile of traditional cultural properties
Topography			
Slope	—	Slopes greater than 25%	—
Biological Resources			
Big Game (mule deer, elk)	—	Production areas as identified by the Colorado Division of Wildlife and Southern Ute Indian Tribe	—
Aztec Gilia and Brack's Cactus	—	Within boundary of mapped potential habitat	—
Knowlton's Cactus	—	—	Within boundary of mapped potential habitat or special designated area
Bald Eagle	—	—	Within 0.5 mile of known nest and roosting sites
Peregrine Falcon, Golden Eagle, and Other Raptors	—	—	Within 0.5 mile of known nest sites
Prairie Dog Colonies	—	—	Within boundaries of known colonies (BLM)
River Otter	—	—	Within boundary of known habitat or special designated area
Riparian Areas	—	—	Within boundary of known habitat or special designated area
Colorado Pikeminnow	—	—	Within boundary of designated critical habitat

3.1.4 Identification of Preliminary Corridors

Following the development of the opportunities and constraints criteria and the GIS model, preliminary corridor segments within the study area were identified. Corridor segments were identified based on areas that exhibited greatest opportunity, and in most cases followed existing linear features such as transmission lines, roads, and West-Wide Energy Corridors. Avoidance and exclusion areas occur within the transmission line corridors, although the width of the corridors allows for the flexibility to identify routes

that would avoid these areas or minimize potential impacts. Figure 3.1-2 displays the preliminary transmission line corridors based on opportunities, avoidances, and exclusions as identified in the MCS.

3.2 Scoping Meetings

In October 2009, the BLM hosted two scoping meetings in Ignacio, Colorado, and Farmington, New Mexico, to gather input on issues for consideration in the Environmental Assessment (EA) that was to be prepared for the Project. In addition to information regarding the federal environmental process, general project information and the preliminary alternative corridors were also available for review and comment at the scoping meetings. Members of the project team were also available for questions and to discuss specific concerns with routing or other project issues.

The scoping period lasted between September 17, 2009, and November 9, 2009. Issues of primary concern identified by the public during the scoping period were:

- Proximity of the transmission line to residences
- Land use issues
- Impacts to visual resources
- Health and safety concerns
- Impacts related to noise

The complete version of the scoping report can be viewed online at: [2009 Scoping Report](#). After review of comments and issues identified by agencies and the public during the scoping period, the BLM decided in December 2009 that the Project would require a higher level of analysis and decided to prepare an EIS instead of an EA.

Tri-State Generation & Transmission Association, Inc.
San Juan Basin Energy Connect
Composite Map

La Plata and Montezuma Counties, Colorado
 and San Juan County, New Mexico

Opportunities & Constraints

- More Opportunity
- Less Opportunity
- Avoid
- Exclude

Hydrology (Medium Resolution NHD)

- Canals / Ditches
- Perennial Streams
- Lake / Reservoir

Electric Infrastructure

(Tri-State, LFEA, WAPA, FEUS)

- Transmission Lines
- Substation
- Proposed Substation



1:110,000

0 0.5 1 2 3 4 Miles

Map Projection: Universal Transverse Mercator Zone 13
 Datum: North American 1983 (CONUS)



ECOSPHERE
 ENVIRONMENTAL SERVICES

March 25, 2009



TRI-STATE
 Generation and Transmission
 Association, Inc.

110k_Composite.mxd

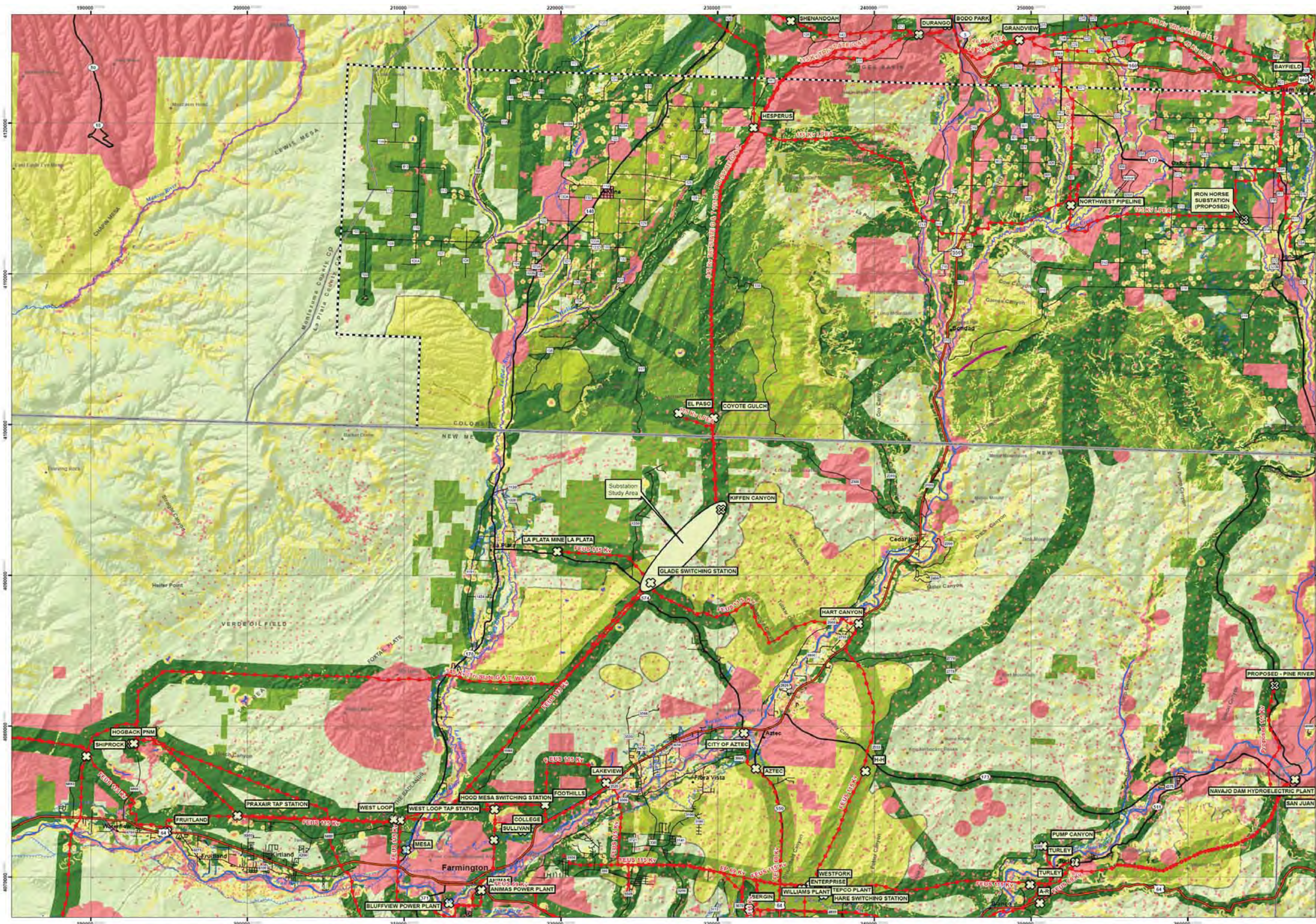


Figure 3.1-1: Composite Map

Tri-State Generation & Transmission Association, Inc.
San Juan Basin Energy Connect
Composite Map Showing
Preliminary Alternative Corridors
 La Plata and Montezuma Counties, Colorado
 and San Juan County, New Mexico

Opportunities & Constraints

- More Opportunity
- Less Opportunity
- Avoid
- Exclude

Hydrology (Medium Resolution NHD)

- Canals/ Ditches
- Perennial Streams
- Lake / Reservoir

Electric Infrastructure

(Tri-State, LPEA, WAPA, FEUS)

- Transmission Lines
- Substation
- Proposed Substation
- Potential Corridor
- Potential Corridor Segment Node

Combined Well And House Density

- 1.6 - 7.1
- 7.1 - 10.1
- 10.1 - 13.4
- 13.4 - 17.8
- 17.8 - 26.1



1:110,000

0 0.5 1 2 3 4 Miles

Map Projection: Universal Transverse Mercator Zone 13
 Datum: North American 1983 (CONUS)



March 25, 2009 110k_Composite.mxd

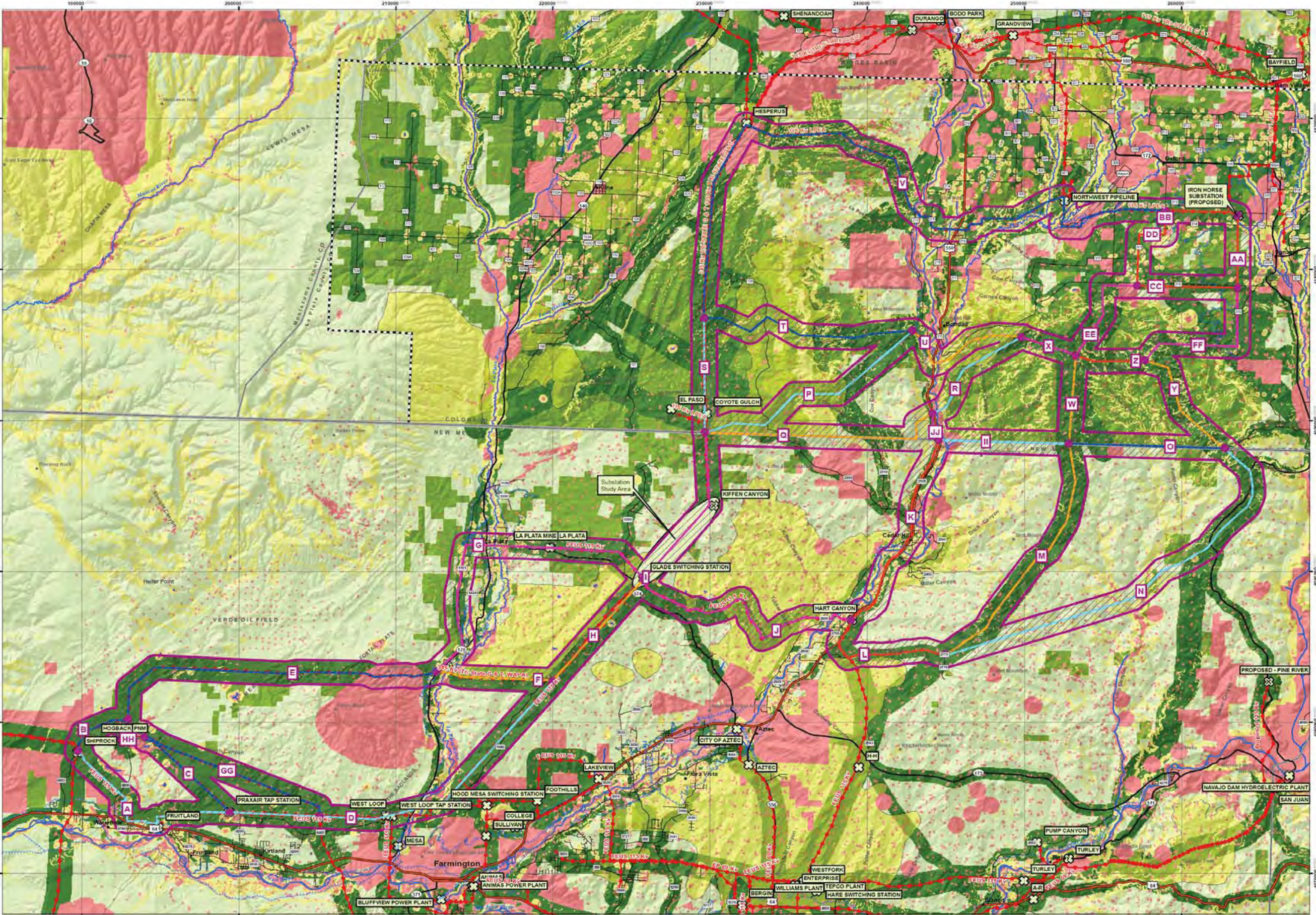


Figure 3.1-2: Composite Map Showing Preliminary Alternative Corridors

3.3 Routing Objectives

After scoping, the process of revising preliminary corridors and identifying preliminary route alternatives was initiated. Some corridor segments were modified or removed from further consideration based on public comment from EA scoping meetings, detailed data review, and extensive field reconnaissance. In some areas, corridor segments representing favorable locations for a transmission line were added. The corridor modifications that resulted from activities described in this section are identified on Figure 3.3-1 and are summarized in Table 1 in Appendix A.

Routing objectives were developed based on input received from agencies, stakeholders, and past transmission line routing experience. The routing objectives were used as the primary tool for identifying preliminary routes within the preliminary alternative corridors. The routing objectives developed specifically for this Project are listed in Table 3.3-1.

Table 3.3-1:
Routing Objective for the San Juan Basin Energy Connect Project

Land Use Objectives
Favor routing transmission line through areas with land uses that are compatible with transmission lines such as industrial, commercial, agricultural
Where they exist within macro corridors, parallel existing linear corridors (roads, transmission lines, pipelines)
Follow property and fence lines where possible to avoid splitting land uses or dividing parcels
Avoid area within 75 feet of homes and buildings so that the ROW is kept clear of existing structures
Avoid cost and additional potential impact by reducing length and number of corner structures
Avoid impacts to prime farmland and farmland of statewide importance by minimizing the number of structures placed in soils considered prime farmland
Avoid impacting the operation of center irrigation pivots by routing around the area being irrigated
Avoid area within 250 feet of oil and gas wells and pipelines to ensure safe operation of both facilities
Where possible, avoid routing transmission line through municipal boundaries
Identify visually sensitive resources including public parks, recreation areas, and scenic byways and utilize terrain and utilize careful route placement to minimize potential impacts to these areas
Avoid impacts to surface mines by routing transmission line approximately 0.25 mile away
Identify and route around areas identified as having high probability of subsidence and areas within ash deposits that may impact transmission line stability
Avoid routing through specially designated areas such as BLM Areas of Critical Environmental Concern and Special Management Areas that are managed for conservation of resources
Transportation Objectives
Avoid safety hazards associated with tall structures in approach/departure surface by constructing transmission line outside of these surfaces per Federal Aviation Administration regulations (14 Code of Federal Regulations 77)
Favor paralleling interstate and state highways and county and local roads (except for scenic byways) where possible
Land Cover Objectives
Avoid routing transmission line through forested land with tall tree species to reduce required tree clearing in ROW and impacts to natural resources.
Favor routing transmission line through shrubland, grassland, cropland, agricultural land because these land cover types generally have land

Table 3.3-1:
Routing Objective for the San Juan Basin Energy Connect Project

uses and/or vegetation that are compatible with transmission lines
Transmission line spans are approximately 800 feet to 1,000 feet; therefore, avoid surface water or other land features such as ravines that are greater than 1,000 feet in width
Avoid pole placement in areas prone to flooding such as 100-year floodplains
Avoid impacts to sensitive resources that exist in wetlands by spanning wetlands or routing around wetlands or through careful pole placement
Existing Utility Infrastructure Objectives
Maintain appropriate/required separation between new transmission line and gas pipelines when selecting final alignment
Favor paralleling within 0.5 mile of existing transmission and distribution lines (ensure that appropriate/required separation between existing linear corridor and new transmission line is maintained)
Avoid interference with communication facilities by routing transmission line approximately 0.25 mile away from communication towers
Cultural and Historic Resources Objectives
Avoid potential degradation of NRHP-listed sites by routing transmission line 0.25 mile from such sites
Work with Tribes to identify culturally sensitive landmarks or sites on Tribal land and avoid routing transmission line within 0.25 mile of these sites
Avoid potential impacts to other cultural and historic resources identified in Class I literature search by avoiding these resources to the extent feasible
Biological Resources Objectives
Reduce potential impacts to sensitive species by avoiding threatened and endangered wildlife and plant species habitat
Reduce potential impacts to avian species by applying a 0.25-mile-wide buffer to raptor nests and a 0.5-mile-wide buffer to eagle nests

Not every objective could be met at all locations throughout the Project, but the various objectives were adhered to as much as feasible. The routing team made efforts to develop route options that best balanced the various concerns from a land use, landowner, environmental and engineering perspective.

3.4 Data and Field Review

To facilitate the routing process, Tetra Tech gathered resource and land use data and created resource maps (Appendix B). Data collected during the MCS was supplemented by Tetra Tech so that resources could be adequately identified within the study area and within the corridors. The list below identifies resource maps and data collected with regard to each map that was prepared to facilitate route identification and route refinement.

- Bald Eagle Habitat
 - Roost and communal roost sites
 - Nest sites
 - Winter concentration
- Black Bear Habitat
 - Human conflict areas
 - Summer concentration
 - Fall concentration

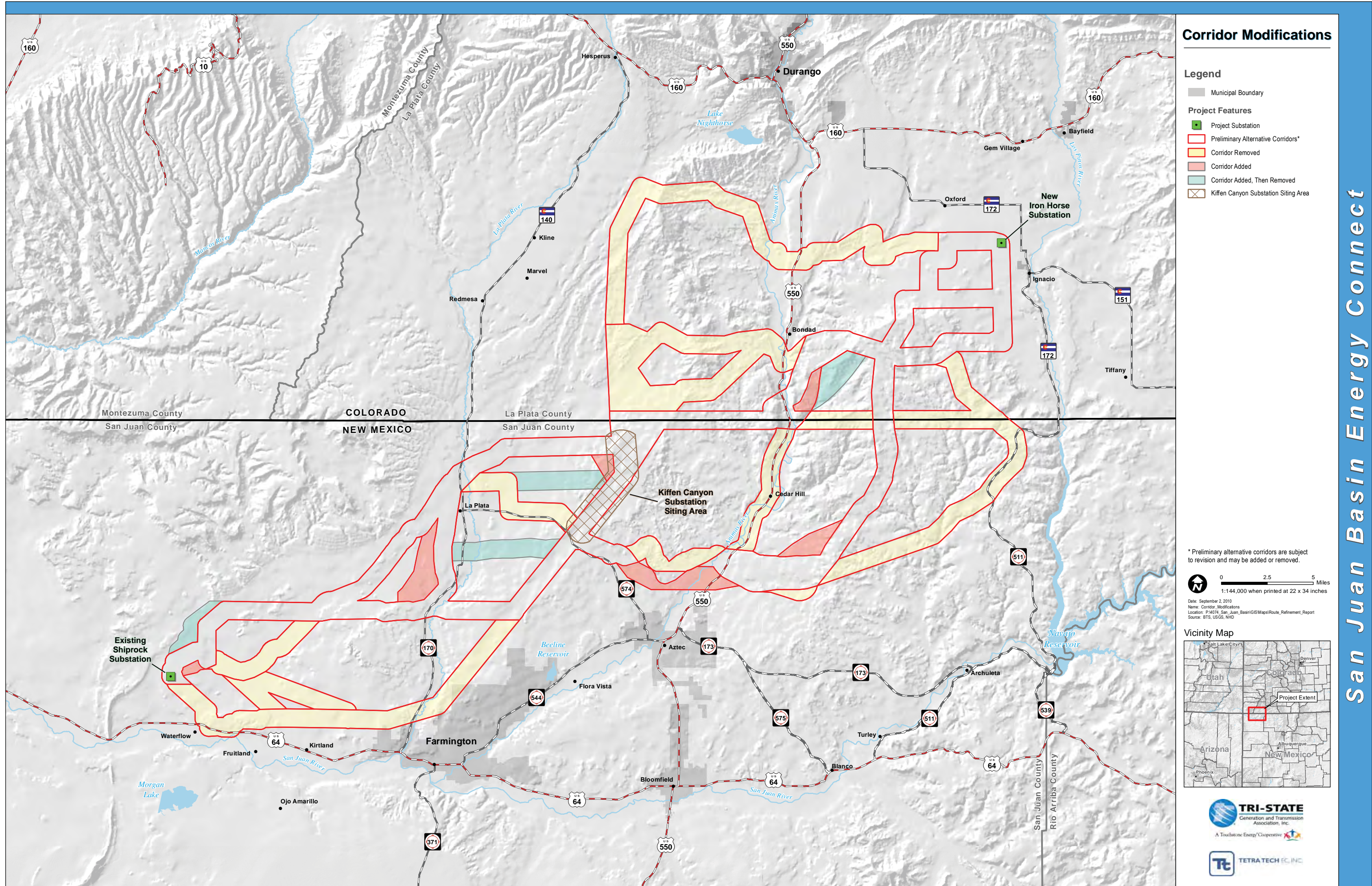


Figure 3.3-1: Corridor Segment Modifications

- Communications Facilities
 - AM antennas
 - Antenna structure registration
 - Broadband radio service and educational broadband service
 - Cellular towers
 - Digital television station transmitter
 - FM antenna
 - Land mobile—broadcast, commercial, and private
 - Microwave towers
 - National television system committee
 - Paging towers
- Cultural and Historic Resources
 - NRHP-listed property
 - Previously recorded sites
 - BLM Cultural Special Designated Areas (SDAs)
- Elk Habitat
 - Migration patterns
 - Migration corridors
 - Severe winter range
 - Winter concentration
- Geologic Formations
- Jurisdiction
- Land Cover
- Land Use
 - La Plata County
 - San Juan County
 - Southern Ute Indian Tribe
- Mule Deer Habitat
 - Migration patterns
 - Highway crossings
 - Concentration areas
 - Severe winter range
 - Winter concentration
- Fossil Fuel Extraction
 - Active wells
 - New wells (not drilled)
 - Waiting on completion
 - Abandoned or temporarily abandoned
 - Unknown/other wells
 - Coal Mine
- Prime Farmland
 - Prime farmland if irrigated
 - Farmland of statewide importance

- Prime farmland if irrigated and drained
 - Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Land Use Sensitivities
 - Residence
 - Pivot irrigation
 - Subdivisions
 - Municipal boundaries
- Slope
- Soil erodibility
- Wildlife and Plant Habitat
 - Prairie dog habitat
 - Raptor habitat
 - BLM raptor nest buffer
 - Mountain lion–human conflict area
 - Pikeminnow/razorback sucker critical habitat
 - Potential Aztec gilia and Brack’s cactus habitat
 - Calving fawning habitat
 - BLM Special Designated Areas—threatened and endangered species
 - BLM Special Designated Areas—wildlife
 - BLM Special Designated Areas—riparian/threatened and endangered species
- Transportation
 - Public airports
 - Private airports
 - Heliports
 - U.S. highways
 - State highways
 - County and local roads
 - Railroads
 - Scenic byways
- Tribal Jurisdiction
- Utilities
 - Existing transmission
 - Planned transmission
 - Existing gas pipelines
 - Other pipelines
 - Existing substations
 - Planned substations
- BLM Visual Resource Management Areas
- Water Resources
 - Springs
 - Perennial streams
 - Intermittent streams

- Canals and ditches
- Perennial lakes
- Intermittent lakes
- Reservoirs
- Swamps and Marshes
- Wetlands
- West-Wide Energy Corridors
- Bureau of Land Management Special Designated Areas
 - Hogback—Threatened and Endangered Species SDA
 - Pinon Mesa Fossil Area—Paleontology SDA
 - Pinon Mesa—Recreation SDA
 - Glade Run—Recreation SDA
 - Thomas Canyon—Recreation SDA
 - East La Plata—Wildlife SDA
 - Bohannon Canyon Complex—Paleontology SDA
 - Cedar Hill Area of Critical Environmental Concern
 - Anasazi Communities—Cultural SDA
 - Animas 1 and 2—Threatened and Endangered Species SDA
 - Animas 3, 4, 5, 6 and 8—Riparian/Threatened and Endangered Species SDA
 - Alien Run—Recreation SDA
 - Rattlesnake Canyon Wildlife SDA
 - Other Recreation, Threatened and Endangered Species, Wildlife, Cultural, and Riparian/Threatened and Endangered Species SDAs not identified within corridors

In general, the study area can be divided into two distinct portions, southwestern and northeastern, with differing landscapes. The southwestern portion of the study area consists of shrub/scrub and grassland/herbaceous land cover. Topography within the southwestern portion of the study area consists of mostly flat land with some hills, mesas, and small canyons occurring sporadically. The northeastern portion of the study area consists primarily of evergreen forest with shrub/scrub and pasture/hay land cover types occurring sporadically. The topography throughout the majority of the northeastern portion of the study area can be generally described as having steeper terrain with many hills and valleys. Major water resources identified within the study area include the La Plata River, which runs parallel to New Mexico Highway 170 and Colorado Highway 140; the Animas River, which runs parallel to U.S. Highway 550, the Los Pinos River, which traverses the far eastern side of the study area; and the San Juan River, which runs parallel to U.S. Highway 64. By necessity, the transmission line would cross both the La Plata and Animas rivers. Four large surface water bodies occur within the study area: Morgan Lake, Beeline Reservoir, Navajo Reservoir in New Mexico, and Lake Nighthorse in Colorado. Other water resources within the study area include springs, perennial rivers and streams, ditches, and canals. Prime farmland within the Study area was identified to occur most frequently within close proximity to water resources, including those rivers listed above. Residential development within the preliminary alternative corridors largely occurs near the cities and towns located in close proximity to major water resources. Cities and towns identified as having a high concentration of residences in New Mexico include Waterflow,

Farmington, La Plata, Aztec, and Cedar Hill. In Colorado, higher concentrations of residential development occur near Ignacio.

With one exception of one locale, numerous oil and gas wells occur throughout the entirety of the study area, and allowing an adequate distance between oil and gas wells and the transmission line routes was taken into consideration throughout the routing process. The exception involves a small portion of the study area near the Shiprock Substation, which is in close proximity to a large coal mining and power plant operation. BHP Billiton operates this underground longwall coal mine, which supplies coal to the San Juan Generation Station located approximately 2.5 miles east of the Shiprock Substation. Although BHP Billiton no longer conducts any surface mining operations within the study area, much of the area directly east of the San Juan Generation Station is still used for reclamation and disposal activities.

Communication facilities, which occur frequently throughout the study area, are mostly located in proximity to population centers, although some communication facilities are located sporadically throughout the study area, outside the population centers. Existing linear disturbance also occurs frequently throughout the study area and includes transmission lines, roads, and railroads. Existing linear disturbance is favorable in terms of transmission line routing, and was considered a priority during transmission line routing. There are several transmission lines that were taken into consideration during routing located in the southwestern portion of the study area, including six 345kV transmission lines and several 115kV transmission lines located near the San Juan Generation Station. Gas pipelines within the study area occur mostly within the northeastern portion of the study area and were also taken into consideration during routing. Three north-south oriented highways occur within the study area and include the New Mexico Highway 170/Colorado Highway 140, U.S. Highway 550, and New Mexico Highway 511/Colorado Highway 172. Several county and local roads also occur throughout the study area. U.S. Highway 550 between Bloomfield, New Mexico, and the Colorado/New Mexico state line is a scenic byway. Transmission line routing took into consideration the visual and recreational implications of routing the transmission line in proximity to a scenic byway.

Wildlife habitat within the study area was identified so that construction activities could be scheduled in such a way that disruption to wildlife within the study area would be reduced as much as possible. Resource maps, available in Appendix B, identify potentially sensitive habitat within the study area, including winter and summer concentration, severe range, raptor roosting and foraging sites, and designated critical habitat. Threatened and endangered species habitat was also identified within the study area, but occurs infrequently throughout the study area and was largely avoided during routing identification.

Two helicopter reconnaissance and windshield-level field reconnaissance trips were completed in September 2009 and April, June, July, and August 2010. The purpose of these reconnaissance efforts was to ground-truth that the corridors that had been previously identified for consideration were appropriate for a transmission line. As a result of these reconnaissance trips, several corridors were modified, added, or removed from further consideration. Corridor modifications that were made throughout the entirety of the routing process are listed in Table 1 in Appendix A.

3.4.1 River Crossings

A major challenge in preliminary route segment identification was the need to cross both the La Plata and Animas rivers to reach the proposed interconnection point at the new Iron Horse Substation near Ignacio. Feasible river crossing alternatives were limited given the constraints along the river corridors, including topography, sensitive resources, and a concentration of agricultural activities as well as residential and commercial development. River crossing alternatives were identified based on a combination of field reconnaissance trips and desktop review of opportunities and constraints (Figure 3.4-1).

Two crossing options for the La Plata River were identified in proximity to existing linear disturbances to minimize impacts. The southern La Plata River crossing option was identified just south of the 345kV transmission line that currently crosses the river approximately 8.5 miles north of Farmington. The northern La Plata River crossing is located just north of the former La Plata Mine coal haul road. Both follow existing linear disturbance.

The Animas River corridor between Aztec, New Mexico, and Bondad, Colorado, was also studied to identify crossing options that would minimize potential impacts to the natural and human environment. Three potential crossing sites were identified. The northern Animas River crossing option is situated on Southern Ute Indian Tribal trust land, along the Colorado/New Mexico border south of Bondad. Two additional potential southern crossings on private land were identified approximately 4 miles northeast of Aztec near Hart Canyon.

Several factors were considered to identify potential Animas River crossings including:

- The location of route options that approach the Animas River from the east and west were identified based on compatibility with existing linear corridor, identified throughout the routing study, which provided minimal new impacts to the natural and human environment.
- Residential, agricultural, and commercial land use and development along the Animas River is dense. Two New Mexico crossings, in one general location north of Aztec, were determined to be suitable for river crossing options.
- In Colorado, a potential crossing was identified just south of Bondad in an area with minimal residential development where the topography presents an opportunity to cross both U.S. Highway 550 and the river with one span.

3.5 Agency and Stakeholder Meetings

In June 2010, a meeting was conducted with staff at BHP Billiton to discuss the preliminary routes and corridor segments that had been identified as of June 2010. As a result of this meeting, corridor segments HH, C, GG, and LL and preliminary route segments within these corridor segments were removed from further consideration because they were not compatible with the heavy mining activity taking place in proximity to the mine (Figure 3.3-1).

The prospect of constructing the transmission line along the former heavy haul road (corridor segments KK and VV) also was discussed with BHP Billiton. The BHP Billiton staff was generally amenable to this proposal; however, they indicated that there would need to be communication with the Ute Mountain Ute

Indian Tribe, the BLM, the BIA, and New Mexico Mining and Minerals Division before finalizing a route within the heavy haul road corridor.

In June 2010, a meeting was conducted with the Ute Mountain Ute Indian Tribe to discuss a route segment that was identified on Tribal land through corridor segment KK. Corridor segment KK was initially identified based on a suggestion by the Ute Mountain Ute Indian Tribe after the scoping meetings in the fall of 2009. The Tribe requested that Tri-State consider a route that crossed the Ute Mountain Reservation. The Tribe informed the Project team that the BIA is responsible for overseeing and monitoring reclamation activities on the portion of the heavy haul road that is on reservation property and that they would be amenable to having a transmission line constructed on reservation land along the heavy haul road so long as the bonding associated with the reclamation of the haul road allowed for one. There were no corridor segments removed or modified as a result of this meeting with the Ute Mountain Ute Indian Tribe.

In July 2010, the Project team met with the BLM to discuss route segments on BLM land and to discuss the status of the NEPA process. The BLM provided comments from resource specialists with regard to specific resources within the remaining corridor segments and along specific route segments. In some cases, resource specialists also identified route segments that they favored versus those that they preferred be avoided. The comments received from BLM resource specialists in June 2010 were reviewed and corridor segment A was removed from consideration because of concerns about Mesa Verde cactus habitat. Comments provided by BLM staff are provided in Appendix C. BLM representatives also discussed potential issues associated with constructing the transmission line in close proximity to existing oil and natural gas wells.

In August 2010, a second meeting with the BLM was conducted to discuss route segments in detail with resource specialists. Resource specialists attended a two-day workshop with Tri-State to discuss preliminary corridor segments and preliminary route segments. The first day of the workshop consisted of a meeting in which resource specialists were given the opportunity to discuss their concerns about each of the remaining corridors. The second day of the workshop consisted of field reconnaissance to review remaining corridors and preliminary route segments on the ground. As a result of the workshop with the BLM, route segments within corridor segments L and M were revised to avoid impacts to mountain bike trails in the Alien Run SDA.

In June 2010, a meeting was conducted with the Southern Ute Indian Tribe to review Project status and to discuss corridor segments and preliminary route segments. The Tribe indicated that they still preferred the use of route segments within corridors M and W. The Tribe also indicated that they prefer to limit activities on reservation land to those areas that have been previously disturbed and noted that new disturbance would require new cultural surveys. As a result of this meeting, route segments within corridor segments U and R were modified to take advantage of existing disturbance along oil and gas well access roads within these corridors.

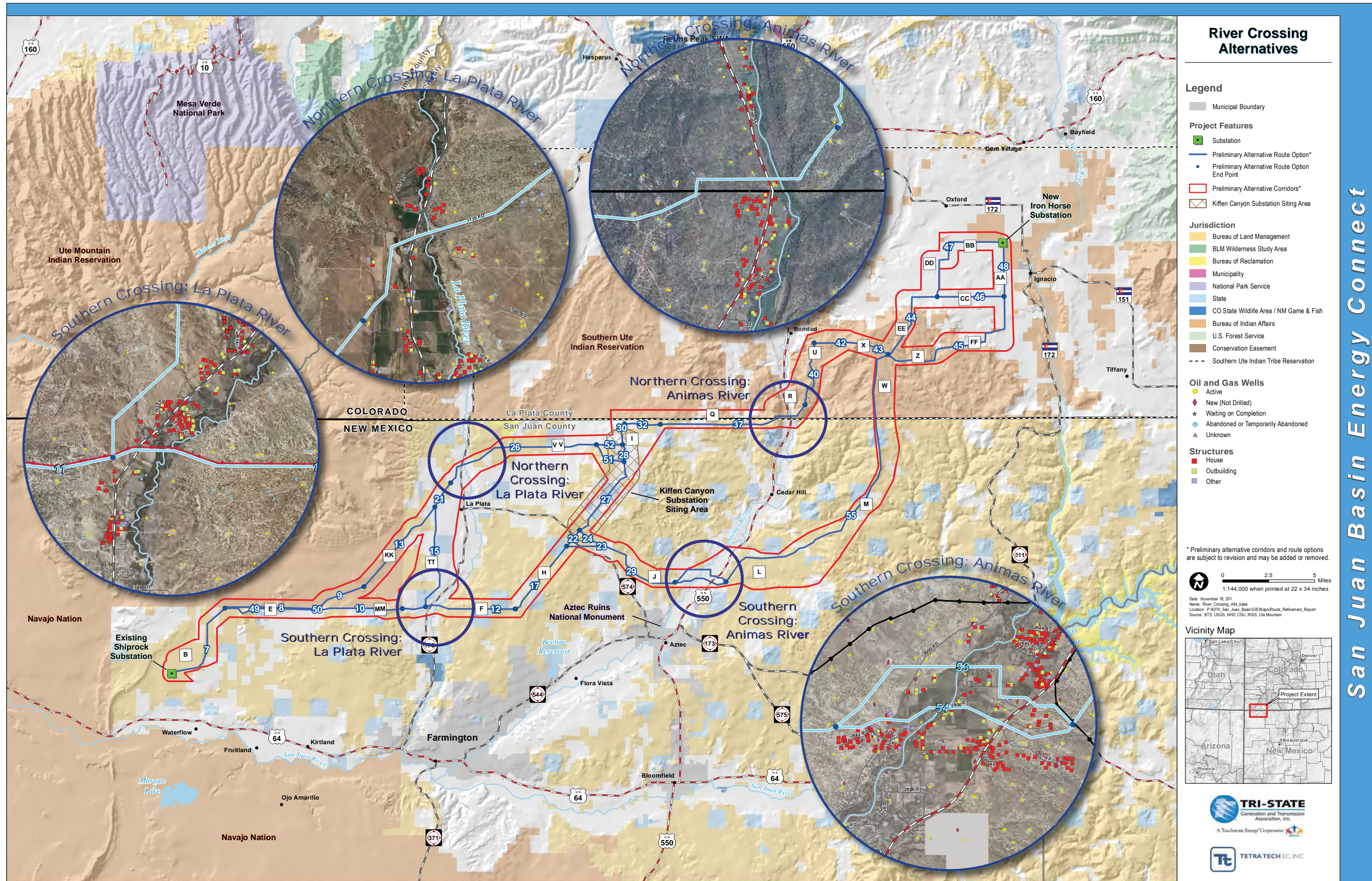


Figure 3.4-1: River Crossing Alternatives

3.6 Preliminary Route Segments

As previously mentioned, the original preliminary corridors were modified based on public and agency input and resource considerations. A summary of the corridor modifications that resulted from the activities described above is provided in Table 1 in Appendix A and Figure 3.3-1 illustrates the corridor segment modifications. Using information collected from the field reconnaissance trips, from stakeholder and agency meetings, and from data shown on resource maps, preliminary route segments were identified within the remaining 24 corridors. These route segments were identified using the routing objectives mentioned in section 3.3.

The Project team identified 48 preliminary route segments within the remaining corridor segments listed in Table 1 in Appendix A. The majority of the identified preliminary route segments follow existing linear corridors for at least a portion of their length. The route segments that were initially identified as a result of field reconnaissance, resource map review, and stakeholder and agency involvement are identified in Figure 3.6-1. It should be noted that many of the route segments identified on this figure were identified early in the route segment process. Many of these segments were modified or removed from further consideration prior to the route refinement workshops because they had the potential to conflict with existing land uses, crossed sensitive species habitat, served as connector segments that no longer needed to be utilized, were constrained due to terrain, did not follow existing linear disturbance, or because other route segments in the same area were more favorable alternatives. Specific route segment modifications are further described in Table 2 in Appendix A.

3.7 Route Refinement Workshops

In September 2010, three route refinement workshops were conducted to discuss Project status and preliminary routes with the general public, agencies and the oil and gas industry. The workshops were held in Farmington and Aztec, New Mexico, and Ignacio, Colorado. The preliminary route segments that were shared with the public and agencies for comment are shown in Figure 3.7-1.

The common themes among comments received by the public and agency representatives included the following:

- Visual impacts
- Loss of property value
- Health concerns associated with electromagnetic fields (EMF)
- Proximity to residences
- Impacts from noise
- Impacts to wildlife

The Colorado Division of Wildlife, the New Mexico Department of Game and Fish, the BLM, and the Southern Ute Indian Tribe expressed a preference for routes that created the least amount of new disturbance, such as routes along existing transmission lines or roadways.

Commenters preferred that the routes be constructed away from populated areas, and many preferred the use of corridors that have already been disturbed, such as KK and VV or F, H, and I.

Commenters in the region of the southern Animas River crossings were strongly opposed to the use of corridors J and L (route segments 53 and 54). The routes in this area would cross active agricultural land and be visible to many residents northeast of Aztec. Many residents in this region stated that they would prefer a route that utilized the northern Animas River crossing in Colorado. There were no comments received from the public that protested the use of the northern Animas River crossing in Colorado.

Other areas of concern include segment 26 in New Mexico, which transects a subdivision, and segment 47 in Colorado, which is located in a relatively densely populated area compared to other potential route segments.

As a result of the comments received during the route refinement workshops and additional investigation by the Project team, the following route segment modifications were made:

- Segments Removed:
 - 47—This segment was removed as a result of comments received from landowners during route refinement workshops and due to high density of residences along County Road (CR) 311
 - 50—This was a connector segment that was located at the intersection of route segments 49 and 10 and no longer serves a purpose
 - 23—This route segment was a connector segment left over from previous route refinement activities and no longer serves its purpose as a connector segment
 - 52—This was a connector segment that was removed because there were no viable substation sites east of this route segment
- Segments Modified:
 - 51—This segment was modified to connect segment 26 with one of the proposed substation sites
 - 53—This segment was straightened to reduce potential visual impacts to residences in Hart Canyon
 - 26—This segment was moved north of the existing carbon dioxide (CO₂) pipeline to move it further away from residences in Hartley Springs
 - 45—This segment was modified to reduce visual impacts to residences

Figure 3.7-2 shows the segment modifications that are described above.

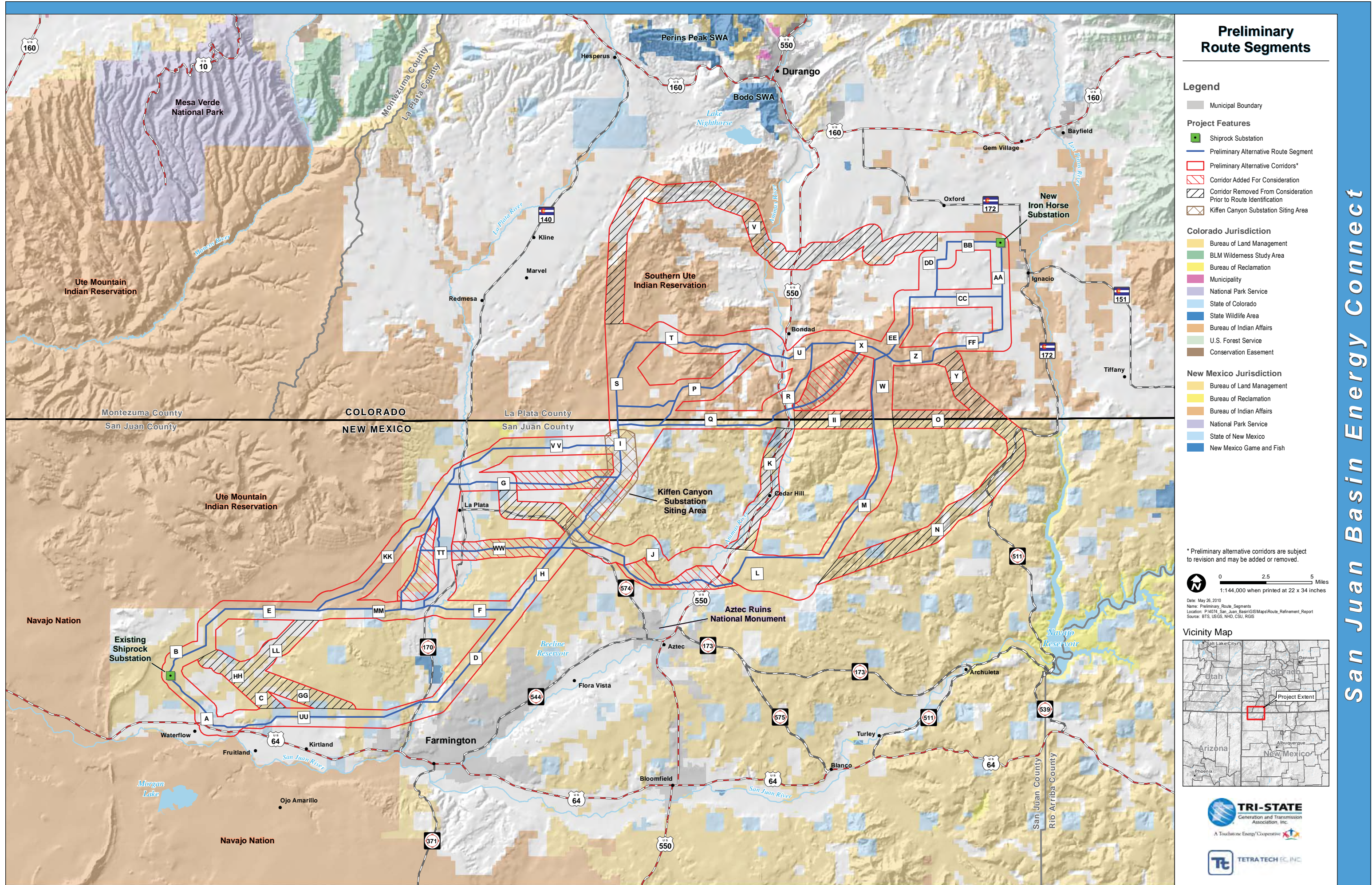


Figure 3.6-1: Preliminary Route Segments

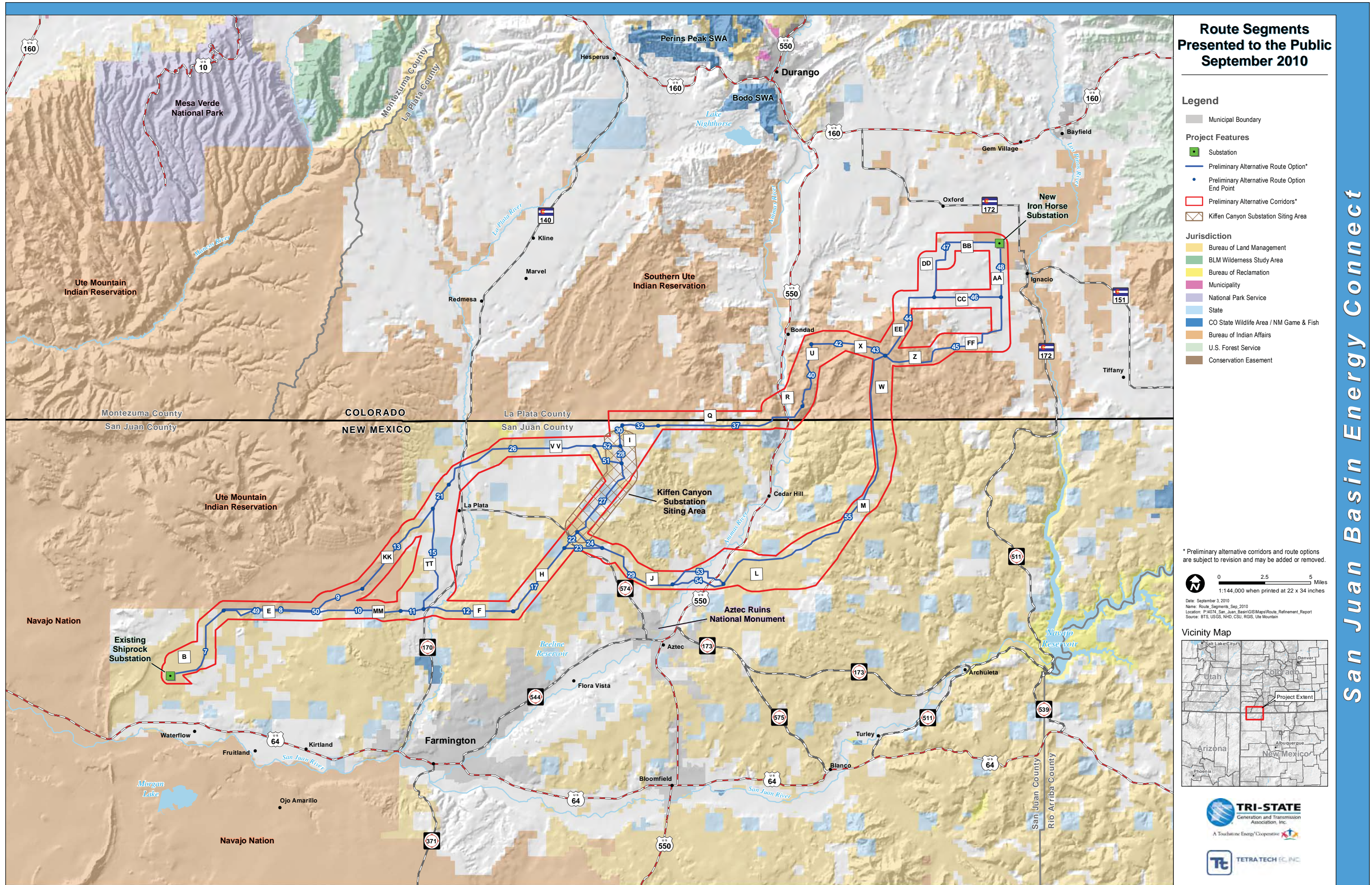


Figure 3.7-1: Route Segments Presented to the Public - September 2010

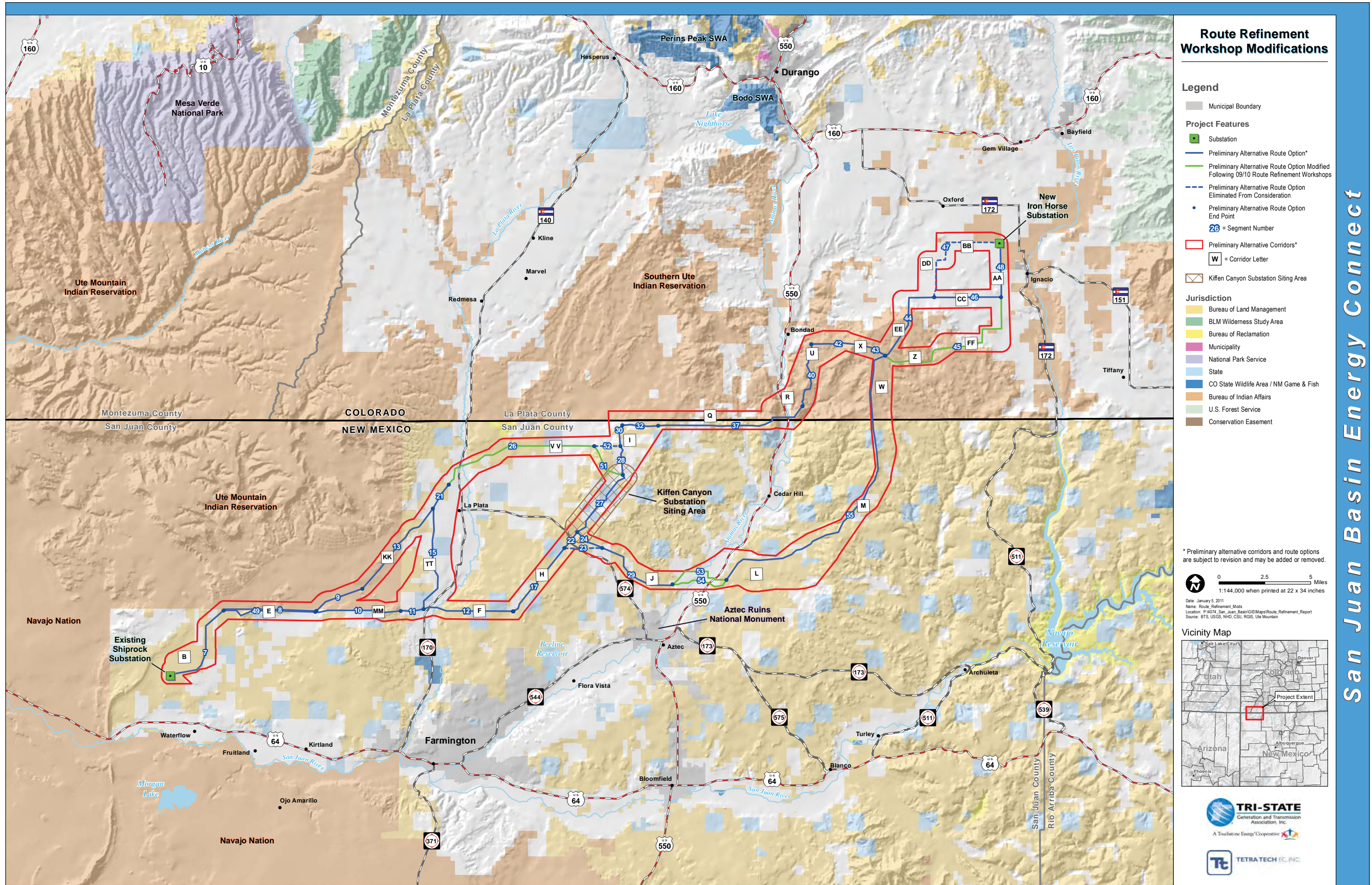


Figure 3.7-2: Route Refinement Workshop Modifications

3.8 Selection of Preliminary Preferred Alternative

Following the route refinement workshops in September 2010, two additional field reconnaissance trips and meetings with the BLM and two additional field reconnaissance trips and meetings with the members and staff of the Southern Ute Indian Tribe were conducted. Additionally, two comparative matrices—the route segment comparative matrix and the route alternative comparative matrix—were utilized as tools in the identification of the preliminary preferred alternative and preliminary alternatives. The BLM held scoping meetings in March 2011 to solicit input from the public and agencies regarding the scope of the EIS and potential alternatives to be analyzed in the EIS. These steps are described below.

3.8.1 *Field Reconnaissance and Meetings*

Additional reconnaissance trips in October 2010 to review route segments in areas of high public concern took place following the route refinement workshops. As a result of this field reconnaissance trip, route segment 47 was removed from further consideration, and route segments 26, 49, and 53 were modified to reduce impacts to landowners in proximity to these route segments. The Project team also performed field reconnaissance in October 2010, December 2010, and February 2011 with members and staff of the Southern Ute Indian Tribe and the BLM. These trips are described below.

In October 2011, a meeting was held with BLM representatives to conduct a field review of some of the route segments that were highly contested during route refinement workshops in September 2010. Route segments that were reviewed with the BLM included route segments 26, 53, 54, and 55. As a result of this field review, segments 26, 53, and 55 were modified slightly to reduce impacts to residences and visual resources and to reduce the impact to the Alien Run Recreational SDA. BLM expressed a preference for an alignment that utilizes segments 7, 49, 10, 11, 12, 17, 22, 27, 28, 30, 32, and 37. This would require the use of the northern river crossing and segments 40, 42, and 43 on Southern Ute Tribal lands.

In December 2010, a field reconnaissance meeting was conducted with the members of and staff for the Southern Ute Indian Tribe and members of BIA's staff. The purpose of this meeting was to show the attendees the route alternatives that had been identified on Southern Ute Indian Tribal trust land. Throughout the meeting there was an open dialogue between all members of the group regarding the Project, routing process, and construction process. The benefits to the project as a whole of utilizing segments 40, 42, and 43 were discussed. When the meeting and field reconnaissance came to an end, the Tribe requested that Tri-State return at a future date to meet with the Southern Ute Indian Tribal Council to present information regarding the feasibility and potential benefits of the use of the northern Animas River crossing.

In February 2011, a meeting was conducted with BLM representatives to conduct a field review of route segment 15. As a result of the field review, the southern portion of route segment 15 was modified so that it followed a pipeline corridor through BLM-managed land.

In February 2011, a meeting was conducted with the Southern Ute Indian Tribal Council to review Project status and to discuss the route alternatives that are located on Tribal trust land. The purpose of the meeting was to determine whether Tribal council members would consider a route that was not within

their earlier identified preferred corridor segments M and W (route segment 55). At this meeting, the Project team, as well as BLM described their preference for the northern river crossing and associated route segments 37, 40, 42, and 43 because it provides opportunities to reduce impacts to residences, follows existing linear disturbance for a large percentage of its length, and is favorable from an engineering standpoint because it would require less new access, fewer potential issues with existing oil and gas infrastructure/pipelines, and would cross the Animas River and U.S. Highway 550 with one span. After the meeting was over, the Tribal council agreed that it was feasible to consider route alternatives that utilize the northern river crossing but did not express a preference for these segments over route segment 55 within corridor segments M and W. The council requested that the Project team hold informational meetings for Tribal membership only. These meetings were held on March 15 and April 16.

3.8.2 Comparative Route Segment Matrix

A data matrix showing key data on preliminary route segments carried forward to the route refinement workshops was created using a GIS database. The data matrix for these preliminary route segments is provided in Appendix D. The data matrix was used as tool for making decisions about individual route segments and incorporated key routing criteria that were used to compare similarly located route segments, and keep, eliminate, or refine them for use in preliminary alternative routes. Routing criteria that were evaluated within the data matrix include length following existing linear features, number of residences in proximity to route segments, length crossing specific types of land cover and land uses, proximity to visual resources, biological resources, soil erodibility, and cultural resources. Impacts were quantified on a segment-by-segment basis for each of the criteria and route segments were eliminated or modified using the data matrix, resource maps, field reconnaissance trips and stakeholder and agency involvement. The route segments that remained as a result of these activities are presented in Section 3.8.3, below.

3.8.3 Preliminary Alternative Routes

Based on data presented in the comparative route segment matrix and after meetings with the BLM, the Southern Ute Indian Tribe, and the public and stakeholders, many route segments were modified, removed from consideration, or added for consideration. The remaining route segments were combined to create end-to-end preliminary routes within 0.25 mile-wide corridors between the Shiprock Substation near Farmington and the proposed Iron Horse Substation site near Ignacio. Table 2, Appendix A provides a summary of the modifications that were made to various route segments and Figure 3.8-1 is a visual representation of the route segment modifications.

Six preliminary alternative routes were carried forward for the end-to-end comparative analysis. The 0.25-mile-wide corridors provide flexibility to avoid site specific constraints in final engineering design. The preliminary routes that were carried forward for consideration as preferred or alternative routes are identified in Figure 3.8-2.

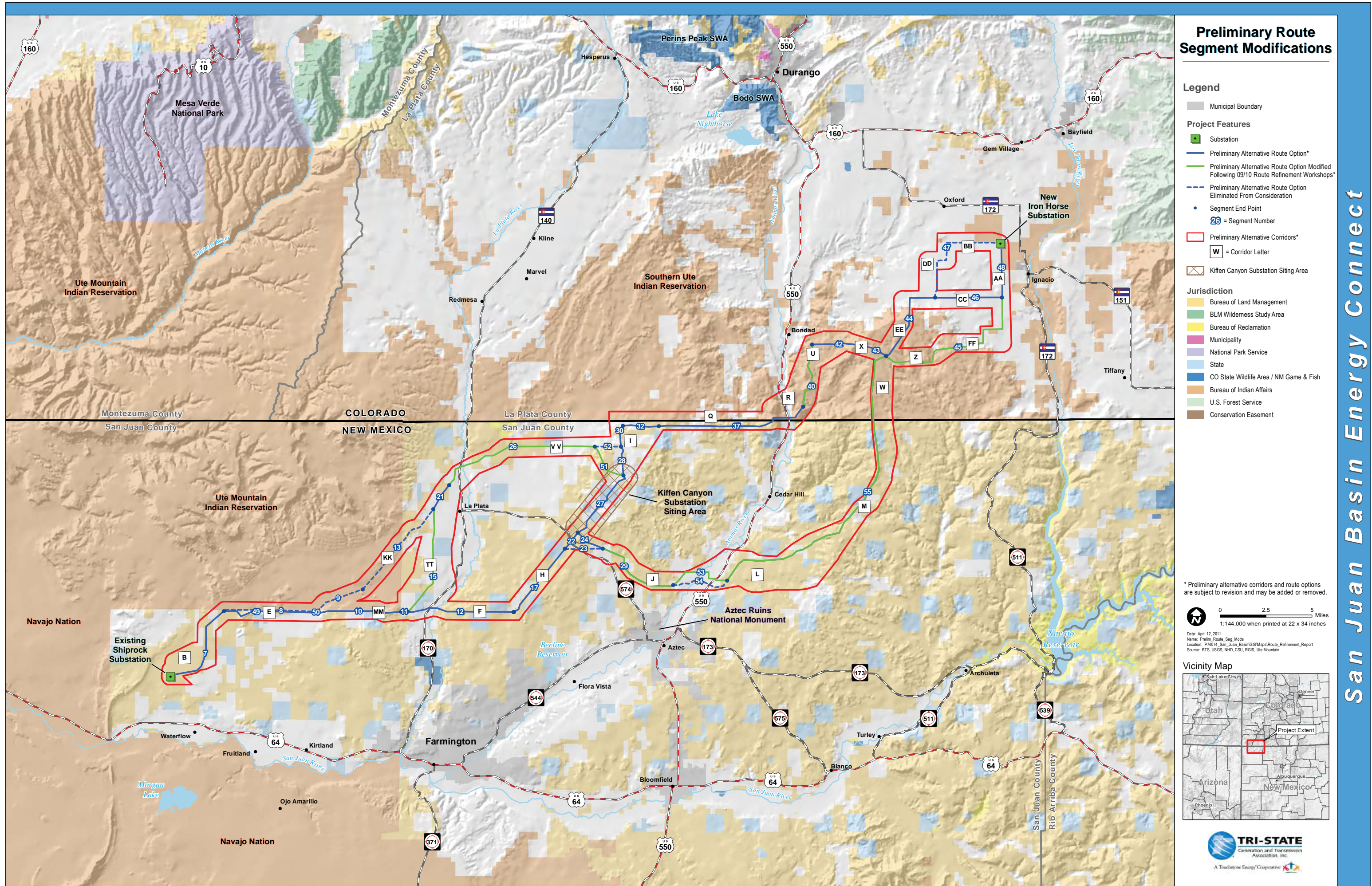


Figure 3.8-1: Preliminary Route Segment Modifications

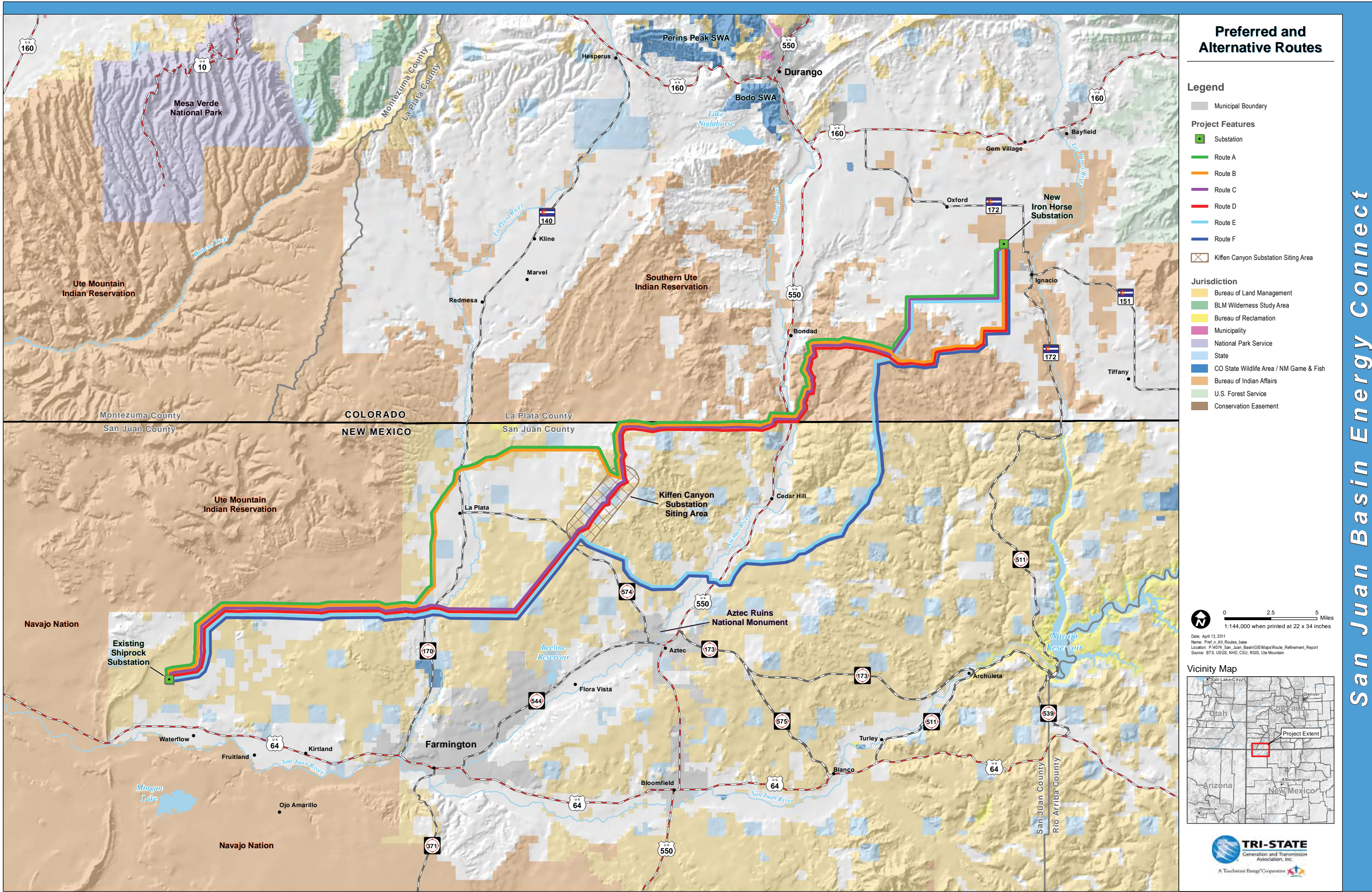


Figure 3.8-2: Preferred and Alternative Routes

3.9 Comparative Alternative Matrix and Identification of Preferred Alternative

A comparative matrix that is similar to the segment matrix described in Section 3.8.2 was prepared to compare preliminary route alternatives. The data analyzed in this matrix was the same as that which was used to analyze the individual route segments but instead of quantifying impacts on a segment-by-segment basis, this comparative matrix analyzed total potential impacts along each of the end to end preliminary alternative routes shown in Figure 3.8-1. The final comparative matrix is provided in Appendix E. Comparative analysis data that were used to define the specific impacts of a given route for the Project include the following categories:

- Existing linear corridor (length of route following existing linear corridor)
- Engineering (length of route, number of angle structures, erodible soils etc.)
- Environmental (proximity to sensitive resources including wildlife, vegetation, water resources, geologic hazards, steep slopes)
- Land use
- Residential impacts
- Proximity to oil and gas wells
- Cost

Once the preliminary alternative routes had been analyzed with regard to the above-listed criteria, the preliminary routes were quantitatively ranked. While this process did not include the weighting of the analysis criteria (i.e., placing more emphasis on one resource over another), the process did rank the preliminary routes relative to each other with respect to each of the criterion. For each criterion, a rank was assigned to each of the preliminary routes with a rank of 1 representing the least impact and a rank of 6 representing the most impact. The assigned ranking reflects the relative impact that a given preliminary alternative route would have compared to the impacts of the other preliminary alternative routes

The alternatives associated with the greatest potential impact (highest total ranking number) in the matrix were Alternative A and Alternative B. The preliminary alternative with the least potential impact in the matrix was Alternative D and was identified as the Preliminary Preferred Alternative that was carried forward to scoping and is described in Section 4.

3.9.1 Scoping Meetings

In March 2011, the BLM hosted three scoping meetings to solicit comments on the scope of the EIS. During the scoping meetings, the public was shown the Preliminary Preferred Alternative and the preliminary alternatives. The preliminary route alternatives map also showed the route segments that had been removed from consideration prior to the EIS scoping meetings (route segments 8, 9, 13, 47, 52, and 54). Although the purpose of this meeting was not to specifically collect comments on the preliminary alternatives, the input received from many expressed a preference for specific segments or routes. The majority of input expressed a preference for the preliminary preferred alternative. No route segments or preliminary alternative routes were modified as a result of comments received during scoping meetings.

4.0 Description of the Preferred and Alternative Routes

Table 4.0-1 provides a summary of key route characteristics of the six alternatives. The text that is provided in the sections that follow describe the alternative routes and as well as key data that played a role in differentiating the alternative routes from one another. Some of the data provided in Table 4.0-1 was not described in the sections that follow because the potential impacts were similar across the different alternatives. For example, the number of oil and gas wells within 250 feet of the alternatives was very similar: either 14 or 15 wells within 250 feet of each route. Figure 3.8-2 provides a visual representation of each of the alternatives.

Table 4.0-1:
Summary of Potential Impacts and Important Routing Data

Route Characteristics	Route A	Route B	Route C	Route D	Route E	Route F
Engineering Factors						
Length of preliminary alternative (miles)	67.71	68.59	64.52	65.41	66.76	67.65
Number of transmission line crossings	6	6	5	5	7	7
Number of road crossings	107	101	98	92	100	94
Number of railroad crossings	1	1	1	1	0	0
Length Following Existing Linear Features (miles)						
Length adjacent to existing transmission (% following)	15.99 (24%)	15.99 (23%)	28.48 (44%)	28.48 (44%)	24.49 (37%)	24.49 (36%)
Length adjacent to U.S. Highways (% following)	0.07 (<1%)	0.07 (<1%)	0.07 (<1%)	0.07 (<1%)	0.07 (<1%)	0.07 (<1%)
Length adjacent to state highways (% following)	0.07 (<1%)	0.07 (<1%)	0.15 (<1%)	0.15 (<1%)	0.15 (<1%)	0.15 (<1%)
Length adjacent to county or local roads (% following)	16.99 (25%)	14.09 (21%)	14.31 (22%)	11.41 (17%)	13.16 (20%)	10.26 (15%)
Length adjacent to railroads (% following)	0.07 (<1%)	0.07 (<1%)	0.07 (<1%)	0.07 (<1%)	0	0
Length adjacent to pipelines (% following)	14.68 (22%)	19.28 (28%)	5.52 (9%)	10.12 (15%)	5.29 (8%)	9.89 (15%)
Length adjacent to parcel lines (% following)	20.39 (30%)	18.62 (27%)	19.78 (31%)	18.01 (28%)	18.82 (28%)	17.05 (25%)
Total length adjacent to existing linear disturbance (not including parcel lines) (% following)	42.93 (63%)	44.48 (65%)	44.22 (69%)	45.76 (70%)	39.13 (59%)	40.67 (60%)
Jurisdiction/Land Ownership (miles)						
Length crossing BLM-managed land (% crossed)	22.61 (33%)	22.61 (33%)	25.88 (40%)	25.88 (40%)	35.61 (53%)	35.60 (53%)
Length crossing BLM-managed SDAs or ACECs (% crossed)	16.66 (25%)	16.66 (24%)	11.48 (18%)	11.48 (18%)	26.29 (39%)	26.29 (39%)

Table 4.0-1:
Summary of Potential Impacts and Important Routing Data

Route Characteristics	Route A	Route B	Route C	Route D	Route E	Route F
Length crossing Southern Ute Indian tribal trust land (% crossed)	13.09 (19%)	14.46 (21%)	13.09 (20%)	14.46 (22%)	7.03 (11%)	8.41 (12%)
Length crossing state of New Mexico-owned land (% crossed)	3.02 (4%)	3.02 (4%)	3.95 (6%)	3.95 (6%)	3.78 (6%)	3.78 (6%)
Length crossing private land (% crossed)	28.99 (43%)	28.50 (42%)	21.59 (33%)	21.12 (32%)	20.34 (30%)	19.86 (29%)
Residences and Land Use						
Residences within 75 feet of centerline	0	0	0	0	0	0
Residences within 75–150 feet of centerline	0	0	0	0	0	0
Residences within 150–300 feet of centerline	5	1	5	1	4	0
Total residences within 300 feet of centerline	5	1	5	1	4	0
Total residences within 0.25 mile of centerline	61	35	64	38	132	106
Number of oil or gas wells within 250 feet of centerline	15	15	15	15	14	14
Number of communication towers within 0.25 feet of centerline	22	22	35	35	27	27
Number of public airports or heliports within 1 mile of centerline	1	0	1	0	1	0
Land Use and Environmental Factors						
Length crossing open water (miles) (% crossed)	0	0	0	0	0.05 (<1%)	0.05 (<1%)
Length crossing developed land (miles) (% crossed)	1.6 (2%)	0.8 (1%)	1.38 (2%)	0.59 (1%)	1.41 (2%)	0.62 (1%)
Length crossing barren land (miles) (% crossed)	1.58 (2%)	1.58 (2%)	0.56 (1%)	0.56 (1%)	0.56 (1%)	0.56 (1%)
Length crossing deciduous forest (miles) (% crossed)	0.53 (1%)	0.63 (1%)	0.53 (1%)	0.63 (1%)	0.49 (1%)	0.59 (1%)
Length crossing evergreen forest (miles) (% crossed)	13.30 (20%)	14.72 (21%)	13.12 (20%)	14.54 (22%)	6.64 (10%)	8.06 (12%)
Length crossing shrub/scrub (miles) (% crossed)	41.59 (61%)	40.60 (59%)	39.99 (62%)	38.99 (60%)	43.42 (65%)	42.42 (63%)
Length crossing grassland/herbaceous (miles) (% crossed)	7.72 (11%)	7.80 (11%)	7.54 (12%)	7.62 (12%)	11.64 (17%)	11.72 (17%)
Length crossing pasture/hay (miles) (% crossed)	0.86 (1%)	1.96 (2%)	1.12 (2%)	2.22 (3%)	1.62 (2%)	2.73 (4%)
Length crossing cultivated crops	0.10	0.10	0	0	0.35	0.35

San Juan Basin Energy Connect
Route Refinement Report

Table 4.0-1:
Summary of Potential Impacts and Important Routing Data

Route Characteristics	Route A	Route B	Route C	Route D	Route E	Route F
(miles) (% crossed)	(<1%)	(<1%)			(<1%)	(<1%)
Length crossing woody wetlands (miles) (% crossed)	0.43 (<1%)	0.41 (<1%)	0.28 (<1%)	0.26 (<1%)	0.58 (<1%)	0.55 (<1%)
Length crossing prime farmland, if irrigated (miles) (% crossed)	6.05 (9%)	7.25 (11%)	1.25 (2%)	2.44 (4%)	1.35 (2%)	2.55 (4%)
Length crossing farmland of statewide importance (miles) (% crossed)	0.56 (<1%)	0.56 (<1%)	1.91 (3%)	1.91 (3%)	3.42 (5%)	3.42 (5%)
Number of water body or perennial stream or river crossings	90	92	101	103	106	108
Length crossing NWI wetlands (miles)	0.04	0.04	0.04	0.04	0.15	0.15
Number of canal or ditch crossings	10	10	4	4	4	4
Length crossing 100-year floodplains (miles)	0	0	0	0	0	0
Visual Resources						
Length crossing Class I and Class II VRM (miles)	9.40	9.40	2.80	2.80	2.80	2.80
Length paralleling (within 0.25 mile) scenic byways (miles)	0	0	0	0	0.47	0.47
Number of scenic byway crossings	0	0	0	0	1	1
Biological Resources						
Length crossing mule deer severe winter range (miles)	8.38	7.00	8.38	7.00	7.95	6.57
Length crossing elk severe winter range (miles)	8.09	8.04	8.09	8.04	6.63	6.58
Length crossing Aztec gilia and Brack's cactus habitat (miles)	0	0	2.20	2.20	6.56	6.56
Number of raptor nests within 0.25 mile of centerline	3	3	2	2	0	0
Cultural Resources						
Number of NRHP-listed sites within 0.25 mile	0	0	0	0	0	0
Number of previously recorded sites crossed	21	21	28	28	20	20
Length crossed with no Class III survey coverage (miles)	2.02	2.02	2.03	2.03	2.20	2.20

4.1 Description of Preferred Alternative

Alternative D was selected as the preferred alternative. The preferred alternative is approximately 65 miles long and consists of route segments 7, 49, 10, 11, 12, 17, 22, 27, 28, 30, 32, 37, 40, 42, 43, 45, and 48 (Figure 4.1-1). Highlights of the preferred alternative are summarized in Table 4.1-1. The preferred alternative follows existing linear features for approximately 46 miles of its total length, the majority of which is transmission lines (28.48 miles). The preferred alternative follows an existing 345kV transmission line north out of Shiprock Substation for approximately 2.7 miles before following the same 345kV transmission line east for approximately 15.9 miles. The preferred alternative crosses the La Plata River at a location parallel to where the 345kV transmission line crosses the La Plata River. Approximately 4 miles east of the La Plata River Crossing, the preferred alternative follows the 345kV transmission line and a 115kV transmission line northeast through the Glade Run Recreation Area, managed by the BLM, for approximately 10.5 miles to the proposed Kiffen Canyon Substation Siting Area. Approximately 0.25 mile south of the Colorado/New Mexico state line, the preferred alternative deviates from the 115kV and 345kV transmission lines and follows existing oil and gas well access roads along the state line for approximately 8.5 miles to the Animas River. The preferred alternative would cross the Animas River and U.S. Highway 550 with one span just north of the state line, and then crosses Southern Ute Indian Tribal trust land in Colorado. From this point, the preferred alternative follows existing oil and gas well access roads and a pipeline corridor north and east for approximately 16.5 miles. After exiting Southern Ute Indian Tribal trust land, after 2.15 miles the preferred alternative parallels CR319 and the new La Plata 115kV transmission line for 4.48 miles to the interconnection point with new Iron Horse Substation. If this route is chosen for construction, it would share structures with the new La Plata 115kV transmission line for a portion of its length in order to reduce potential impacts.

Table 4.1-1:
Highlights of Preferred Alternative

Route Characteristic		Quantity
Existing Disturbance	Total Length (miles)	65.41
	Length Paralleling Transmission (miles)	28.48
	Length Paralleling Pipeline (miles)	10.12
	Length Paralleling Road (miles)	11.63
	Length Paralleling Existing Linear Disturbance (miles)	45.76
Jurisdiction	Length Crossing BLM-managed Land (miles)	25.88
	Length Crossing Southern Ute Indian Tribal Trust Land (miles)	14.46
	Length Crossing State of New Mexico-owned Land (miles)	3.95
	Length Crossing Privately-owned Land (miles)	21.12
Proximity to Residences	Residences within 300 feet of Route Centerline	1
	Residences within 0.25 mile of Route Centerline	38

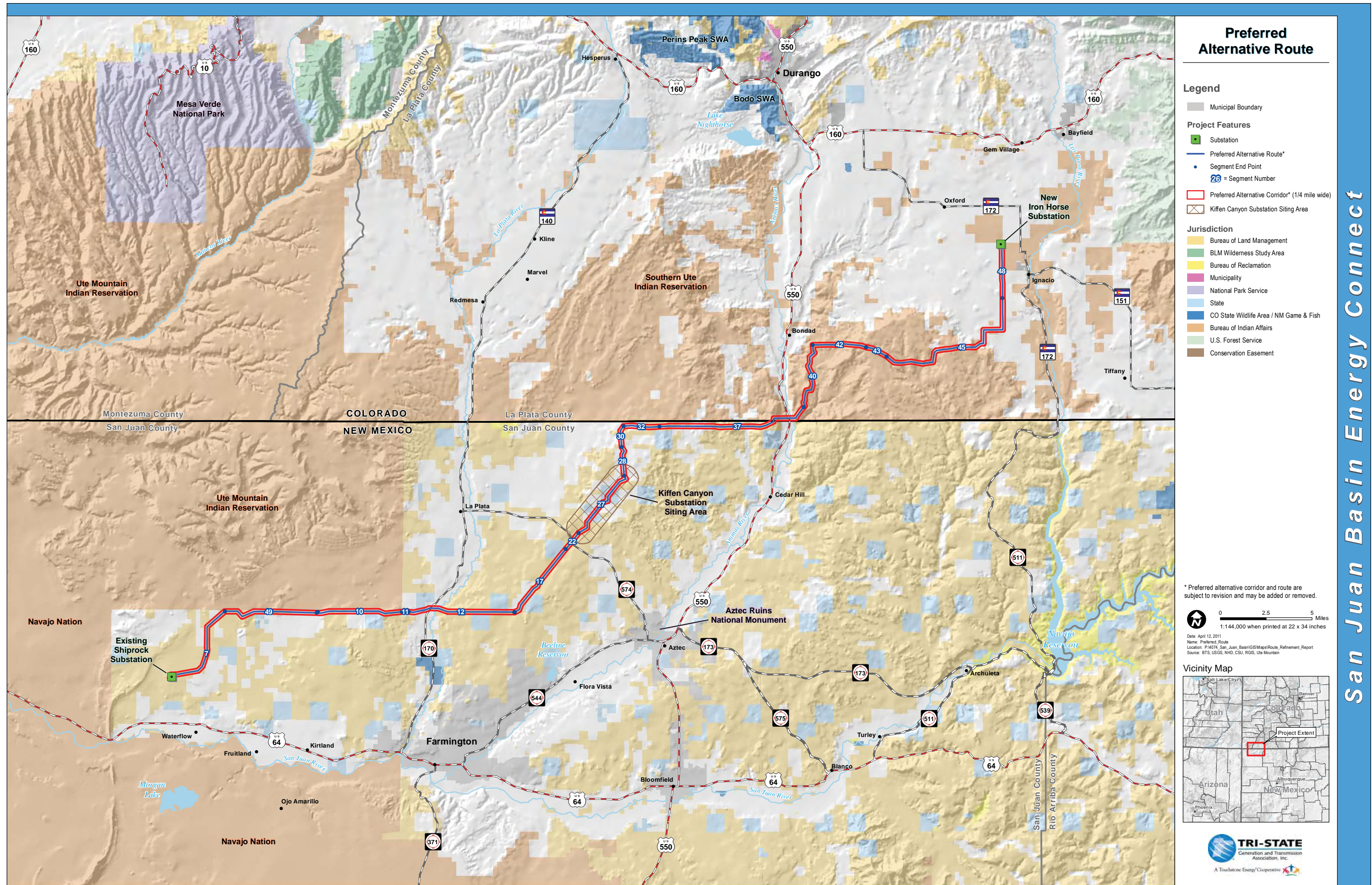
4.2 Description of Alternatives

4.2.1 Alternative A

Route segments 7, 49, 10, 11, 15, 21, 26, 51, 28, 30, 32, 37, 40, 42, 43, 44, 46, and 48 make up the approximately 68-mile-long Alternative A (Alternative A) (Figure 3.8-2.). Highlights of Alternative A are summarized in Table 4.2-1. Alternative A would utilize the northern Animas River crossing option as described in Section 3.4-1. Alternative A follows existing linear disturbance for approximately 42.93 miles (63 percent) of its total length. The greatest type of existing linear disturbance followed by this route segment is county and local roads. Alternative A follows an existing 345kV transmission line out of Shiprock Substation north and east for approximately 13.7 miles. Alternative A then follows an existing natural gas pipeline corridor and oil and gas well access roads for 6 miles north through the BLM Thomas Canyon SDA. The Thomas Canyon SDA is managed for recreation and is a Visual Resource Management (VRM) Class II Objective rating. At a point just east of the Thomas Canyon SDA, Alternative A heads northeast and parallels the former La Plata Mine coal haul road to the north and east for approximately 4.8 miles. At this point, Alternative A turns east and follows a large CO₂ pipeline corridor, portions of which are designated West-Wide Energy Corridor, for approximately 7.5 miles before reaching the proposed Kiffen Canyon Substation Siting Area. From the Kiffen Canyon Substation Siting Area, Alternative A would follow the same alignment as the preferred alternative described in Section 4.1 until the endpoint of route segment 43. At the terminus of route segment 43, Alternative A would follow oil and gas well access roads north for approximately 3.6 miles to a point that is just east of the intersection of CR309A and CR319. From here, Alternative A would follow County Road 319 for approximately 5 miles east before it follows the new LPEA 115kV transmission line north for approximately 3 miles to the interconnection point with the new Iron Horse Substation.

Table 4.2-1:
Highlights of Alternative A

Route Characteristic		Quantity
Existing Disturbance	Total Length (miles)	67.72
	Length Paralleling Transmission (miles)	15.99
	Length Paralleling Pipeline (miles)	14.68
	Length Paralleling Road (miles)	17.13
	Length Paralleling Existing Linear Disturbance (miles)	42.93
Jurisdiction	Length Crossing BLM-managed Land (miles)	22.61
	Length Crossing Southern Ute Indian Tribal Trust Land (miles)	13.09
	Length Crossing State of New Mexico-owned Land (miles)	3.02
	Length Crossing Privately-owned Land (miles)	28.99
Proximity to Residences	Residences within 300 feet of Route Centerline	5
	Residences within 0.25 mile of Route Centerline	61



4.2.2 Alternative B

Alternative B (Alternative B) is approximately 68 miles long and consists of route segments 7, 49, 10, 11, 15, 21, 26, 51, 28, 30, 32, 37, 40, 42, 43, 45, and 48. Highlights of Alternative B are summarized in Table 4.2-2 and shown in Figure 3.8-2. Alternative B would utilize the northern Animas River crossing option as described in Section 3.4-1. This route alternative follows existing linear disturbance for approximately 44.5 miles (65 percent) of its total length. The greatest type of existing linear disturbance followed by this route segment is gas pipelines. Alternative B consists of route segments used to make up the preferred alternative in Colorado and Alternative A in New Mexico. Alternative B would follow the same alignment as described in Section 4.2.1 for Alternative A until the endpoint of route segment 43. From that endpoint, Alternative B would follow the same alignment as the preferred alternative route described in Section 4.1.

Table 4.2-2:
Highlights of Alternative B

Route Characteristic		Quantity
Existing Disturbance	Total Length (miles)	68.59
	Length Paralleling Transmission (miles)	15.99
	Length Paralleling Pipeline (miles)	19.28
	Length Paralleling Road (miles)	14.23
	Length Paralleling Existing Linear Disturbance (miles)	44.48
Jurisdiction	Length Crossing BLM-managed Land (miles)	22.61
	Length Crossing Southern Ute Indian Tribal Trust Land (miles)	14.46
	Length Crossing State of New Mexico-owned Land (miles)	3.02
	Length Crossing Privately-owned Land (miles)	28.50
Proximity to Residences	Residences within 300 feet of Route Centerline	1
	Residences within 0.25 mile of Route Centerline	35

4.2.3 Alternative C

Route segments 7, 49, 10, 11, 12, 17, 22, 27, 28, 30, 32, 37, 40, 42, 43, 44, 46, and 48 make up Alternative C (Alternative C), which is approximately 65 miles long. Highlights of Alternative C are summarized in Table 4.2-3 and shown in Figure 3.8-2. Alternative C would utilize the northern Animas River crossing option as described in Section 3.4-1. This route alternative follows existing linear disturbance for approximately 44.2 miles (69 percent) of its total length. The greatest type of existing linear disturbance followed by this route segment is transmission lines. Alternative C consists of route segments used to make up the preferred alternative in New Mexico and Alternative A in Colorado. Alternative C would follow the same alignment as described in Section 4.1, up to the endpoint of route segment 43, and would follow the same alignment as Alternative A between the endpoint of route segment 43 and the interconnection point with the new Iron Horse Substation as described in Section 4.2.1.

Table 4.2-3:
Highlights of Alternative C

Route Characteristic		Quantity
Existing Disturbance	Total Length (miles)	64.52
	Length Paralleling Transmission (miles)	28.48
	Length Paralleling Pipeline (miles)	5.52
	Length Paralleling Road (miles)	14.43
	Length Paralleling Existing Linear Disturbance (miles)	44.22
Jurisdiction	Length Crossing BLM-managed Land (miles)	25.88
	Length Crossing Southern Ute Indian Tribal Trust Land (miles)	13.09
	Length Crossing State of New Mexico-owned Land (miles)	3.95
	Length Crossing Privately-owned Land (miles)	21.59
Proximity to Residences	Residences within 300 feet of Route Centerline	5
	Residences within 0.25 mile of Route Centerline	64

4.2.4 Alternative D

Preliminary Alternative D is the preferred alternative described in Section 4.1.

4.2.5 Alternative E

Route segments 7, 49, 10, 11, 12, 17, 22, 24, 29, 54, 55, 44, 46, and 48 make up the 67-mile Alternative E (Alternative E). The southern Animas River crossing would be used for Alternative E. Highlights of Alternative E are summarized in Table 4.2-4 and shown in Figure 3.8-2. This route alternative follows existing linear disturbance for approximately 39.1 miles (59 percent) of its total length. The greatest type of existing linear disturbance followed by this route segment is transmission lines. This alternative utilizes some of the route segments associated with the preferred alternative in New Mexico as well as some of the route segments associated with Alternative B in Colorado. Between the Shiprock Substation and the terminus of route segment 22, Alternative E follows the same alignment through the glade to the proposed Kiffen Canyon Substation Siting area as the preferred alternative route as described in Section 4.1. From the Kiffen Canyon Substation Siting Area, portions of Alternative E follow a 115kV transmission line and oil and gas well access roads east and southeast for approximately 7.8 miles to the southern Animas River crossing option, approximately 4 miles north of Aztec. To the extent feasible, Alternative E would parallel property or parcel lines on the eastern side of the Animas River to avoid impacts to landowners. After crossing the Animas River and Highway 550, Alternative E would parallel 2651 Road and a natural gas pipeline north and northeast for approximately 6 miles. From this point, Alternative E would parallel the Arkansas Loop Road and large natural gas pipeline corridor for 10.8 miles to the terminus of segment 55. Because of the oil and gas development located along the Arkansas Loop Road, the transmission line would need to be offset from the road as much as 0.5 mile to allow adequate space between the transmission line and existing facilities. From the terminus of segment 55, Alternative E would follow the same alignment as Alternative A until its interconnection point at the new Iron Horse Substation.

Table 5.2-4:
Highlights of Alternative E

Route Characteristic		Quantity
Existing Disturbance	Total Length (miles)	66.76
	Length Paralleling Transmission (miles)	24.49
	Length Paralleling Pipeline (miles)	5.29
	Length Paralleling Road (miles)	13.38
	Length Paralleling Existing Linear Disturbance (miles)	39.13
Jurisdiction	Length Crossing BLM-managed Land (miles)	35.61
	Length Crossing Southern Ute Indian Tribal Trust Land (miles)	7.03
	Length Crossing State of New Mexico-owned Land (miles)	3.78
	Length Crossing Privately-owned Land (miles)	20.34
Proximity to Residences	Residences within 300 feet of Route Centerline	4
	Residences within 0.25 mile of Route Centerline	132

4.2.6 Alternative F

Alternative F (Alternative F) is approximately 68 miles long and would utilize route segments 7, 49, 10, 11, 12, 17, 22, 24, 29, 53, 55, 45, and 48. Highlights of Alternative F are summarized in Table 4.2-5 and shown in Figure 3.8-2. Alternative F would utilize the southern Animas River crossing and utilizes the same alignment as Alternative E in New Mexico and the same alignment as the preferred route in Colorado. This route alternative follows existing linear disturbance for approximately 40.7 miles (60 percent) of its total length. The greatest type of existing linear disturbance followed by this route segment is transmission lines. Between the Shiprock Substation and the terminus of segment 55 Alternative F would utilize the same alignment as Alternative E, as described in Section 4.2.5. Between the terminus of segment 55 and the interconnection with the new Iron Horse Substation, Alternative F would utilize the same alignment as the preferred alternative as described in Section 4.1.

Table 4.2-5:
Highlights of Alternative F

Route Characteristic		Quantity
Existing Disturbance	Total Length (miles)	67.65
	Length Paralleling Transmission (miles)	24.49
	Length Paralleling Pipeline (miles)	9.89
	Length Paralleling Road (miles)	10.48
	Length Paralleling Existing Linear Disturbance (miles)	40.67
Jurisdiction	Length Crossing BLM-managed Land (miles)	35.60
	Length Crossing Southern Ute Indian Tribal Trust Land (miles)	8.41
	Length Crossing State of New Mexico-owned Land (miles)	3.78
	Length Crossing Privately-owned Land (miles)	19.86
Proximity to Residences	Residences within 300 feet of Route Centerline	0
	Residences within 0.25 mile of Route Centerline	106

5.0 Summary

This Route Refinement Report documents the process used to develop preliminary route alternatives for the Project including:

- The Macro Corridor Study
- Eight field reconnaissance trips
- Agency and stakeholder meetings and input
- Public input resulting from two scoping meetings and a route refinement workshop
- Preliminary route identification
- Comparative matrix analysis
- Identification of preferred and alternative routes

In determining the preferred alternative and alternative routes it was important to identify ways to minimize new disturbance and utilize existing disturbance while considering comments and concerns of the public and various agencies across jurisdictions. Key factors that were used to determine the preferred include the following:

- The preferred alternative follows the greatest length and percentage (45.76 miles, 70 percent) of existing linear disturbance.
- The preferred alternative parallels two high-voltage transmission lines through the Glade Run SDA.
- The preferred alternative utilizes oil and gas well access roads on private land, BLM land, and Southern Ute Indian Tribal trust land.
- The preferred alternative would have a minimal impact on residences with only one residence within 300 feet of the route centerline.
- In Colorado, the preferred alternative would utilize the new LPEA 115kV transmission line structures to minimize disturbance and impacts.
- The Animas River crossing utilized by the preferred route would cross the Animas River and U.S. Highway 550 in one span resulting in minimal impacts when compared with the southern river crossing which would require multiple spans.
- The northern Animas River crossing is favored based on comments received during the Route Refinement Workshops in 2010 and the scoping meetings in 2011.

The next step in the environmental review process is for the BLM to determine which alternatives will be carried forward for analysis in the draft EIS. The BLM may choose to remove from consideration some of the alternatives presented in this report or to identify new alternatives not described in this report. The public will have an opportunity to comment on the draft EIS once it has been completed. Once the final EIS has been prepared, the BLM will prepare a Record of Decision addressing how the findings of the EIS, including consideration of alternatives, were incorporated into the decision-making process.

Appendix A: Corridor and Route Modification Descriptions

San Juan Basin Energy Connect
Route Refinement Report

This page intentionally left blank.

Table 1:
Corridor Segment Modification Tracking

Corridor ID	No Change	Removed	Modified	Added	Comments
A		■			Potential conflict with mining/reclamation activities Would increase overall length of transmission line Important Mesa Verde cactus habitat and significant occurrences identified during survey
B	■				Explored for additional routing options
C		■			Given the removal of corridor segment HH and UU, this corridor no longer serves as a connector to other segments Potential conflict with mine operations Congestion within corridor segment due to power plant operations
D		■			Given the removal of corridor segments A and UU, this corridor no longer serves the purpose of connecting the southern corridor segments to the northern corridor segments Potential conflict with development to south along U.S. Highway 64 Potential to need to cross four existing 345-kV transmission lines
E	■				
F	■				
G		■			Corridor was removed because the other identified crossings of the La Plata River provided better options by limiting impact to residences and existing land use. Corridor segment lacks existing disturbance
H	■				
I			■		Corridor segment was expanded slightly to the west to take advantage of the West Wide Energy Corridor that is located just west of Corridor Segment I Expansion provides for flexibility for siting the proposed Kiffen Canyon Substation
J			■		Constrained because of steep terrain, narrow canyon, and existing transmission line Northern portion of corridor removed from considerations because of constraints associated with steep canyon slopes and requirement for multiple angle structures Southern portion of corridor expanded to allow for a more direct route south of the canyon Corridor expansion includes proposed Animas River crossing options
K		■			High-density residential development within the corridor segment The corridor segment is in close proximity to the Las Animas River and construction near the river may result in impacts to water quality and visual impacts for those who use the river for recreational purposes Sensitive habitats including riparian and cliff habitats exist within the corridor segment There are known land dispute issues between landowners within the corridor segment that may result in delays in obtaining easements from landowners.

Table 1:
Corridor Segment Modification Tracking

Corridor ID	No Change	Removed	Modified	Added	Comments
L			■		Small portion on southern end of corridor segment was removed because of a developed subdivision within the corridor segment
M			■		Corridor segment modified per comments received from the BLM to reduce impacts to the Alien Run Special Designated Area
N		■			Sensitive biological resources exist within the corridor segment including eagle and falcon nest sites and foraging areas, the corridor segment contains habitat for BLM Sensitive Species There are recreation resources within and in close proximity to the corridor segment; construction near these resources may result in negative impacts to recreationists There is limited access for construction within approximately 50 percent of the corridor segment The corridor segment does not follow existing linear corridor for its entire length BLM specialists indicated that this route is not preferred given the biological and recreational issues described above
O		■			Given the removal of corridor segment N, this corridor no longer serves the purpose of connecting the southern corridor segments to the northern corridor segments A route through this corridor would add additional mileage to the overall transmission line route Corridor did not follow any existing linear disturbance
P		■			Removed given the lack of access, steep terrain, and limited existing disturbance
Q	■				
R			■		Expanded to accommodate Animas River crossing Expanded for exploration of route options following existing roads, pipelines, and topographic features
S		■			Removed due to lack of access, steep terrain, and limited existing disturbance
T		■			Removed because corridor S was removed and this corridor segment no longer serves as a connector to corridor segment U Removed given the lack of access, steep terrain, and limited existing disturbance
U	■				
V		■			Removed given the lack of access, remote location, and additional line miles related to the distance the corridor segment travels
W	■				
X	■				
Y		■			Given the removal of corridor segment N, this corridor no longer serves the purpose of connecting the southern corridor segments to the northern corridor segments A route through this corridor would add additional mileage to the overall transmission line route
Z	■				
AA	■				

Table 1:

Corridor Segment Modification Tracking

Corridor ID	No Change	Removed	Modified	Added	Comments
BB		■			Removed given the dense residential development along CR311 and CR314, which limits routing options and impacted residences
CC	■				
DD		■			Removed given the dense residential development along CR311 and CR314, which limits routing options and impacted residences
EE	■				
FF	■				
GG		■			Given the removal of corridor segment HH and UU, this corridor segment no longer serves the purpose as a connecting segment Removed because of potential conflict with mining operations and congestion near the power plant
HH		■			Removed because of comments received from mine with regard to severe congestion in proximity to mining operations and the power plant
II		■			Removed given the lack of access and limited existing disturbance
JJ		■			Due to proximity, corridor segment R was expanded to encompass corridor segment JJ
KK		■			Corridor removed because of successful reclamation activities and limited access Reclamation activities are the responsibility of the mine operators and are under the oversight of various entities, resulting in challenging land rights issues
LL		■			Removed because, with the removal of corridor segment HH, this corridor segment no longer serves as a connector segment to the heavy haul road. Potential conflict with mine operations
MM	■				
TT			■		Expanded corridor segment allows for route options that are further from homes and utilize existing disturbance associated with roads and wells
UU		■			Given the removal of corridor segment A, this corridor no longer serves the purpose of connecting the southern corridor segments to the northern corridor segments Potential conflict with mine operations
VV			■		Expanded slightly to accommodate an additional route option crossing the West Wide Energy Corridor Expansion provides for flexibility for siting the proposed Kiffen Canyon Substation
WW		■		■	Does not follow existing disturbance Does not provide best option for crossing the La Plata River Causes a greater impact to residences when compared with other corridor segments in the region

Table 2:
Route Segment Modification Tracking

Route Segment ID	No Change	Removed	Modified	Added	Comments
1		■			Small connector segment removed due to removal of route segments 3 and 4
2		■			Route segment associated with removed corridor segments A, UU, and D Potential conflict with reclamation and other mine activities Would increase overall length of transmission line Important Mesa Verde cactus habitat and significant occurrences identified during survey Potential conflict with development to south along U.S. Highway 64 Potential to need to cross four existing 345-kV transmission lines
3		■			Route segment associated with removed corridor segments HH and LL Removed because of comments received from mine with regard to severe congestion in proximity to mining operations and the power plant
4		■			Small connector segment removed because of the removal of route segments 3 and 6
5		■			Connector segment replaced with route segment 12
6		■			Route segment identified as a result of expansion of corridor segment B The expansion of the corridor segment was eliminated, thereby eliminating the route segment
7	■				
8		■			Given the removal of route segment 13, this route segment no longer served as a connector segment to access the heavy haul road A route utilizing segment 49 will be utilized to connect to route segment 10
9		■			The majority of this route segment has been successfully reclaimed and as a result has limited access The reclamation activities are the responsibility of the mine operator and are under the oversight of various entities, resulting in challenging land rights issues
10	■				
11	■				
12	■				
13		■			The majority of this route segment has been successfully reclaimed and as a result has limited access The reclamation activities are the responsibility of the mine operator and are under the oversight of various entities, resulting in challenging land rights issues
14		■			Constrained because of difficult terrain Potential conflict with BLM management objectives for the Thomas Canyon Special Designated Area

Table 2:
Route Segment Modification Tracking

Route Segment ID	No Change	Removed	Modified	Added	Comments
15		■			Route segment was modified to reduce potential impacts to residences and visual resources and to follow a greater length of existing linear disturbance This route segment was moved to the west so that it would be approximately 0.3 mile further away from landowners than originally proposed
16		■			Given the removal of route segments 14 and 18, this corridor segment no longer serves the purpose as a connecting segment
17	■				
18		■			Constrained because of difficult terrain Potential conflict with BLM management objectives for the Thomas Canyon Special Designated Area
19		■			Given the removal of route segments 16 and 20, this corridor segment no longer serves the purpose as a connecting segment.
20		■			Does not follow existing disturbance Does not provide best option for crossing the La Plata River Causes a greater impact to residences when compared with other segments in the region
21	■				
22	■				
23		■			Given the modifications to the Kiffen Canyon Substation siting area, this small connector segment no longer serves the purpose as a connecting segment
24	■				
25		■			Does not follow existing disturbance Does not provide best option for crossing the La Plata River Causes a greater impact to residences when compared with other segments in the region
26			■		Modified to route around the former La Plata mine Modified to so that it is north of the existing CO ₂ pipeline instead of south of the pipeline to allow for a greater distance between existing homes in the Hartley Springs subdivision and the proposed transmission line
27	■				
28	■				
29			■		Modifications of corridor segment J resulted in modifications to this route segment Constrained because of steep terrain, narrow canyon, and existing transmission line
30	■				

Table 2:
Route Segment Modification Tracking

Route Segment ID	No Change	Removed	Modified	Added	Comments
31		■			Route segment associated with removed corridor segment S Removed because of the lack of access, steep terrain, and limited existing disturbance
32	■				
33		■			Route segment associated with removed corridor segment S and P Removed because of the lack of access, steep terrain, and limited existing disturbance
34		■			Small connector segment associated with removed corridor segment P Removed because of the lack of access, steep terrain, and limited existing disturbance
35		■			Route segment associated with removed corridor segment T Removed because of the lack of access, steep terrain, and limited existing disturbance
36		■			Route segment associated with removed corridor segment P Removed because of the lack of access, steep terrain, and limited existing disturbance
37	■				
38		■			Small connector segment associated with removed corridor segment P and T Removed because of the lack of access, steep terrain, and limited existing disturbance
39		■			Given the removal of route segment 41, this route segment no longer served as a connecting segment between 39 and 41
40			■		Modified to increase length following existing linear disturbance
41		■			Route segment identified as a result of expansion of corridor segment R The expansion of the corridor segment was eliminated, thereby eliminating the route segment
42	■				
43	■				
44	■				
45			■		Modified to address a landowner concern regarding visual impacts The route segment was moved from the top of a hill to the toe of a slope
46	■				
47		■			This segment was removed because of landowner concern and dense residential development
48	■				
49	■				
50		■			This route segment is a small connector segment that was removed because adequate connecting segments to route segments 10 and 11 already exist

Table 2:

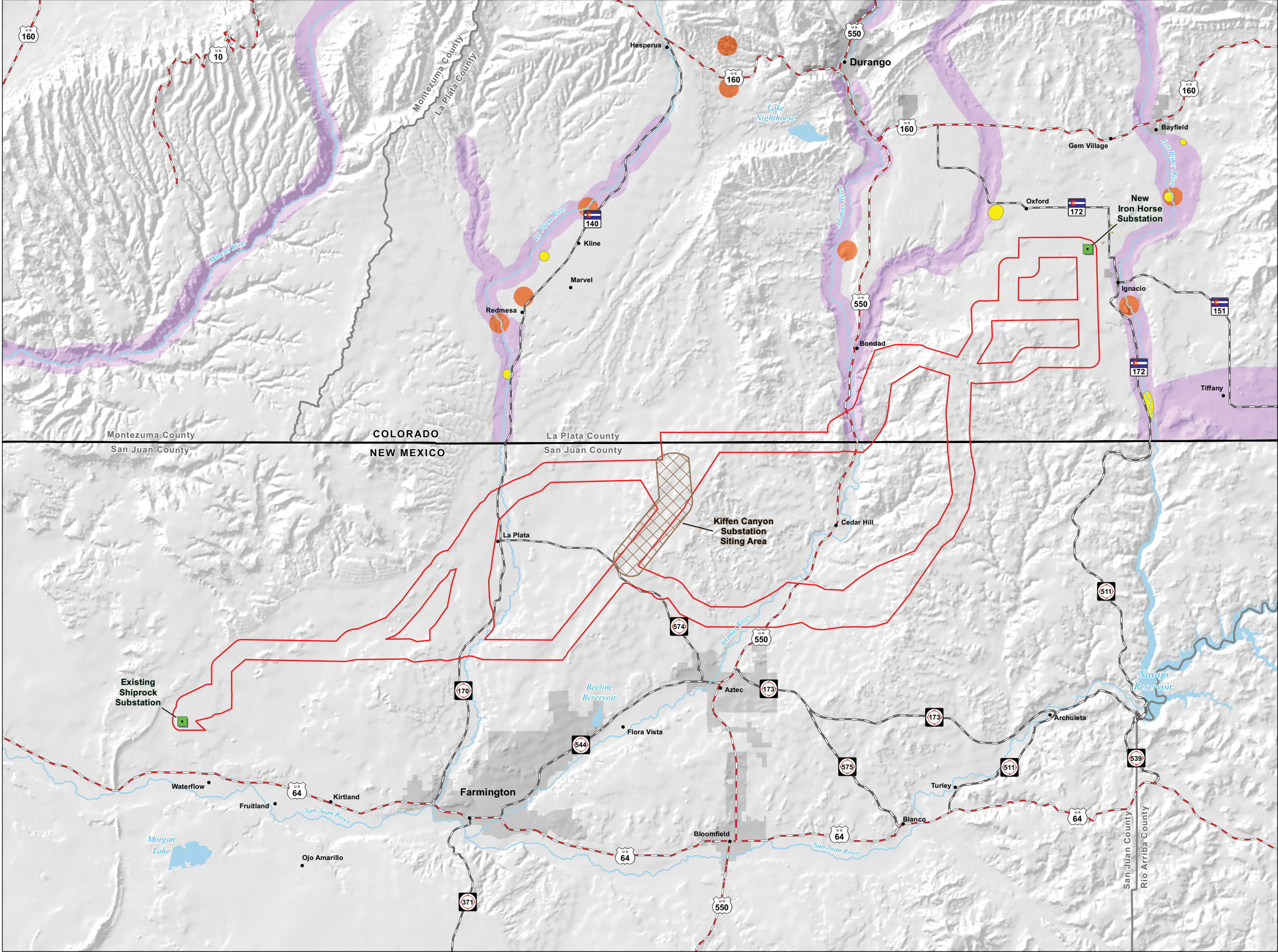
Route Segment Modification Tracking

Route Segment ID	No Change	Removed	Modified	Added	Comments
51			■		Modified to connect to the proposed Kiffen Canyon Substation The Kiffen Canyon Substation siting area was minimized to reflect the smaller area where construction of a substation is feasible
52		■			Served as a connector segment to the proposed Kiffen Canyon Substation A substation at the termination of this connector segment was found to be no longer feasible
53			■		Modified to head directly east instead of south. This modification will reduce potential impacts to visual resources
54		■			Route segment was removed because it has more residences in close proximity, follows a shorter length of parcel lines, and has more road and water crossings when compared with route segment 53
55			■		Based on comments made by the BLM, this route segment was modified to route around the Alien Run Special Designated Area

Appendix B: Resource Maps

San Juan Basin Energy Connect
Route Refinement Report

This page intentionally left blank.



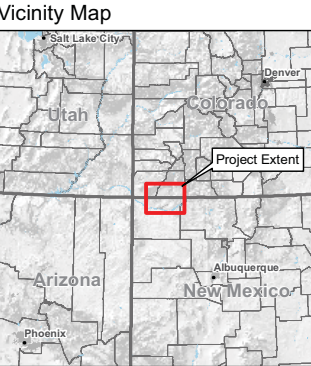
Bald Eagle Habitat

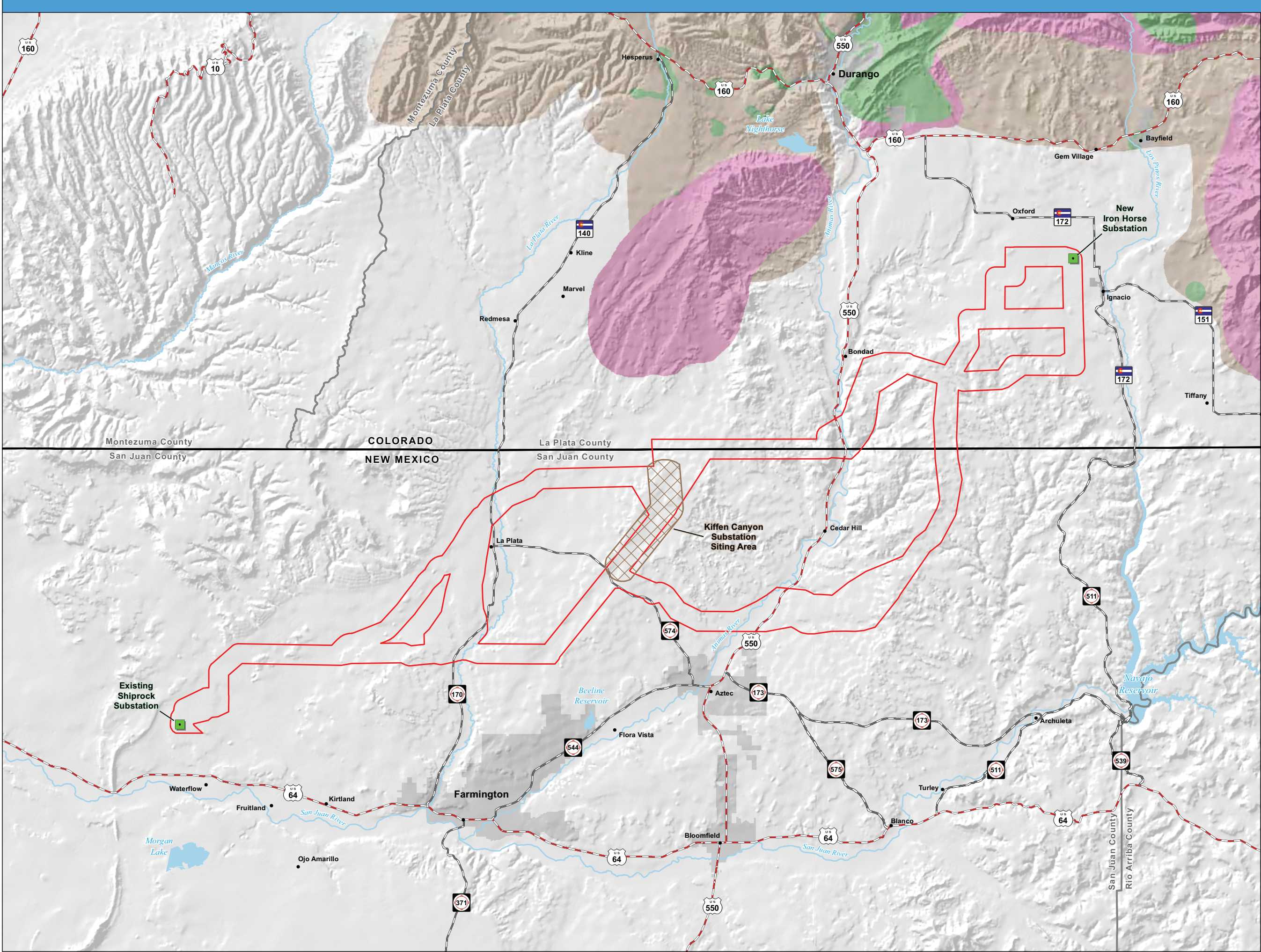
- Legend**
- Municipal Boundary
 - Project Features**
 - Project Substation
 - Preliminary Alternative Corridors*
 - Kiffen Canyon Substation Siting Area
 - Bald Eagle Habitat**
 - Roost or Communal Roost Site
 - Nest Site
 - Winter Concentration

* Preliminary alternative corridors are subject to revision and may be added or removed.

0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

Date: September 2, 2010
Name: Bald_Eagle
Location: P14074_San_Juan_Basin\GIS\MapResource_Maps
Source: BTS, USGS, NHD, CDOW





Black Bear Habitat

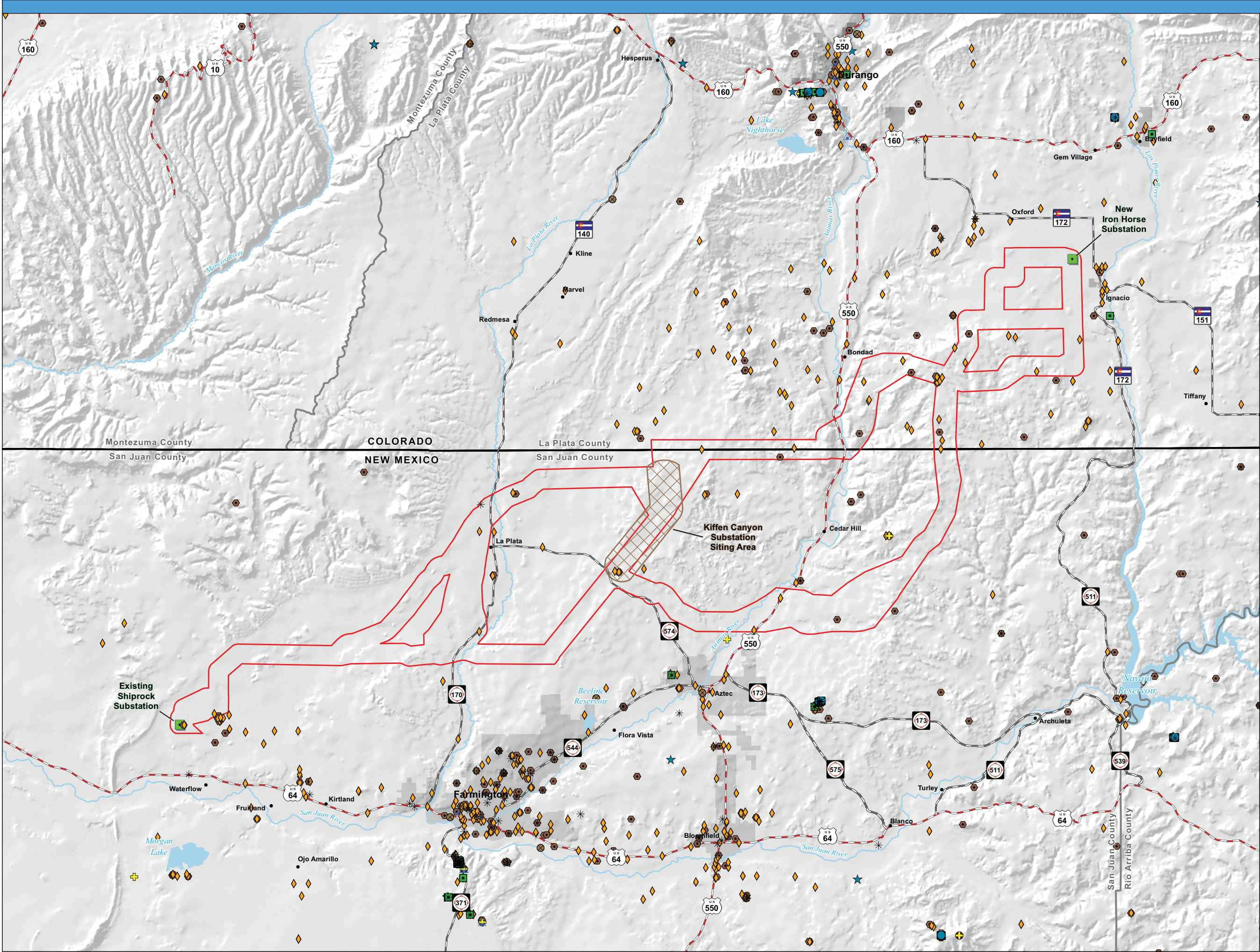
- Legend**
- Municipal Boundary
 - Project Features**
 - Project Substation
 - Preliminary Alternative Corridors*
 - Kiffen Canyon Substation Siting Area
 - Black Bear Habitat**
 - Human Conflict Area
 - Summer Concentration
 - Fall Concentration

* Preliminary alternative corridors are subject to revision and may be added or removed.

0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

Date: September 2, 2010
Name: Black Bear
Location: P14074_San_Juan_Basin\GIS\MapResource_Maps
Source: BTS, USGS, NHD, CDOW





Communications

Legend

Municipal Boundary

Project Features

Project Substation

Preliminary Alternative Corridors*

Kiffen Canyon Substation Siting Area

Communications Facilities

AM Antenna

Antenna Structure Registration

Broadband Radio Service and Educational Broadband Service

Cellular Tower

Digital Television Station Transmitter

FM Antenna

Land Mobile - Broadcast

Land Mobile - Commercial

Land Mobile - Private

Microwave Tower

National Television System Committee

Paging Tower

* Preliminary alternative corridors are subject to revision and may be added or removed.

0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

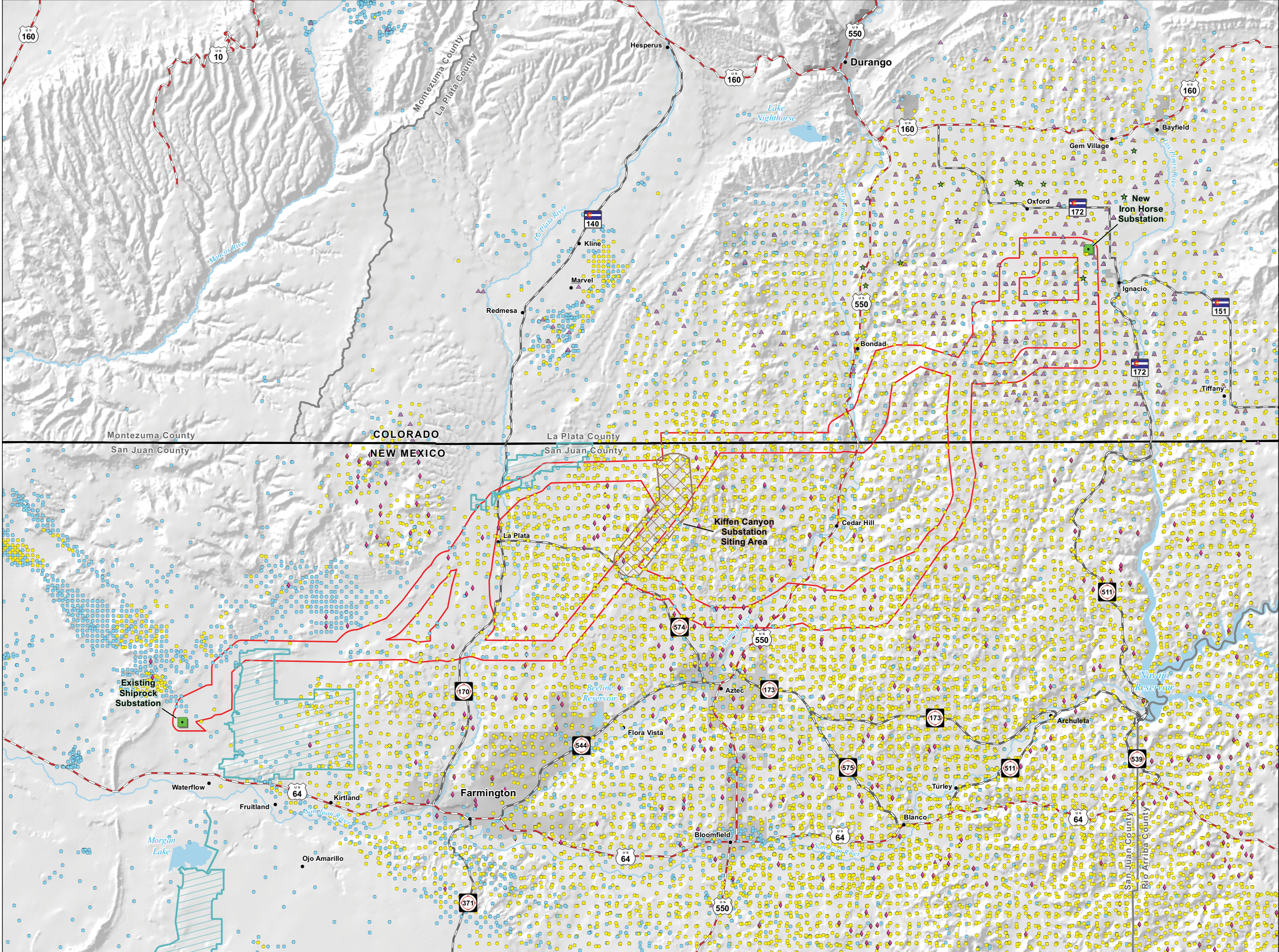
Date: September 2, 2010
Name: Communications
Location: P14074_San_Juan_Basin\GIS\MapResource_Maps
Source: BTS, USGS, NHD, FCC

Vicinity Map

TRI-STATE
Generation and Transmission Association, Inc.
A Touchstone Energy Cooperative

TETRA TECH EC, INC.

San Juan Basin Energy Connect



Fossil Fuel Extraction

Legend

Municipal Boundary

Project Features

- Project Substation
- Preliminary Alternative Corridors*
- Kiffen Canyon Substation Siting Area

Oil and Gas Wells

- Active
- New (Not Drilled)
- Waiting on Completion
- Abandoned or Temporarily Abandoned
- Unknown

Mines

- Coal Mine

* Preliminary alternative corridors are subject to revision and may be added or removed.

0 2.5 5 Miles

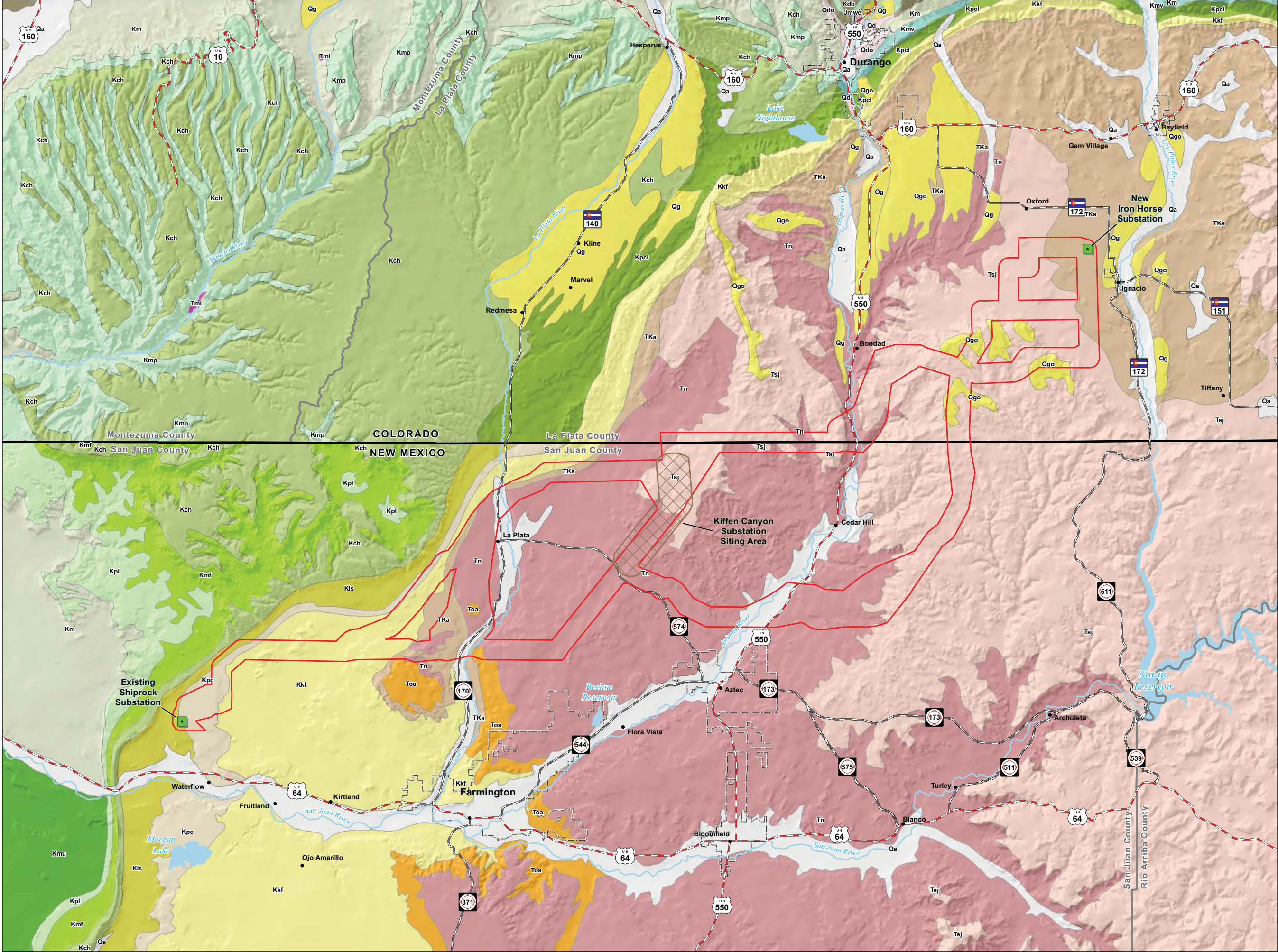
1:144,000 when printed at 22 x 34 inches

Date: September 2, 2010
Name: Oil_Gas_Wells
Location: P14074_San_Juan_Basin\GIS\MapResource_Maps
Source: BTS, USGS, NHD, COGCC, NMEMNRD

Vicinity Map

TRI-STATE
Generation and Transmission
Association, Inc.
A Tractone Energy Cooperative

TETRA TECH EC, INC.



Geologic Formations

Legend

Municipal Boundary

Project Features

- Project Substation
- Preliminary Alternative Corridors*
- Kiffen Canyon Substation Siting Area

Geologic Formations

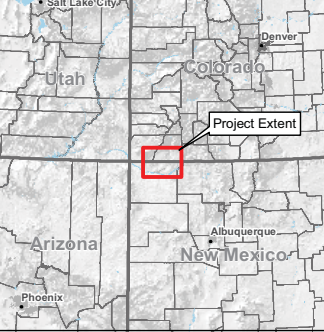
- Jmwe Morrison, Wanakah, and Entrada Formations
- Kch Cliff House Sandstone
- Kdb Dakota Sandstone and Burro Canyon Formation
- Kkf Kirtland Shale and Fruitland Formation
- Kls Lewis Shale
- Km Mancos Shale
- Kmf Menefee Formation
- Kmj Mancos Shale, Juana Lopez Member
- Kmp Menefee Formation and Point Lookout Sandstone
- Kmu Mancos Shale, Upper Part
- Kmv Mesa Verde Formation, Undivided
- Kpc Pictured Cliffs Sandstone
- Kpcl Pictured Cliffs Sandstone and Lewis Shale
- Kpl Pierre Shale, Lower Unit
- Qa Modern Alluvium
- Qd Glacial Drift of Pinedale and Bull Lake Glaciations
- Qdo Older Glacial Drift
- Qg Gravels and Alluviums
- Qgo Older Gravels and Alluviums
- TKa Animas Formation
- Tmi Middle Tertiary
- Tn Nacimiento Formation
- Toa Ojo Alamo
- Tsj San Jose Formation

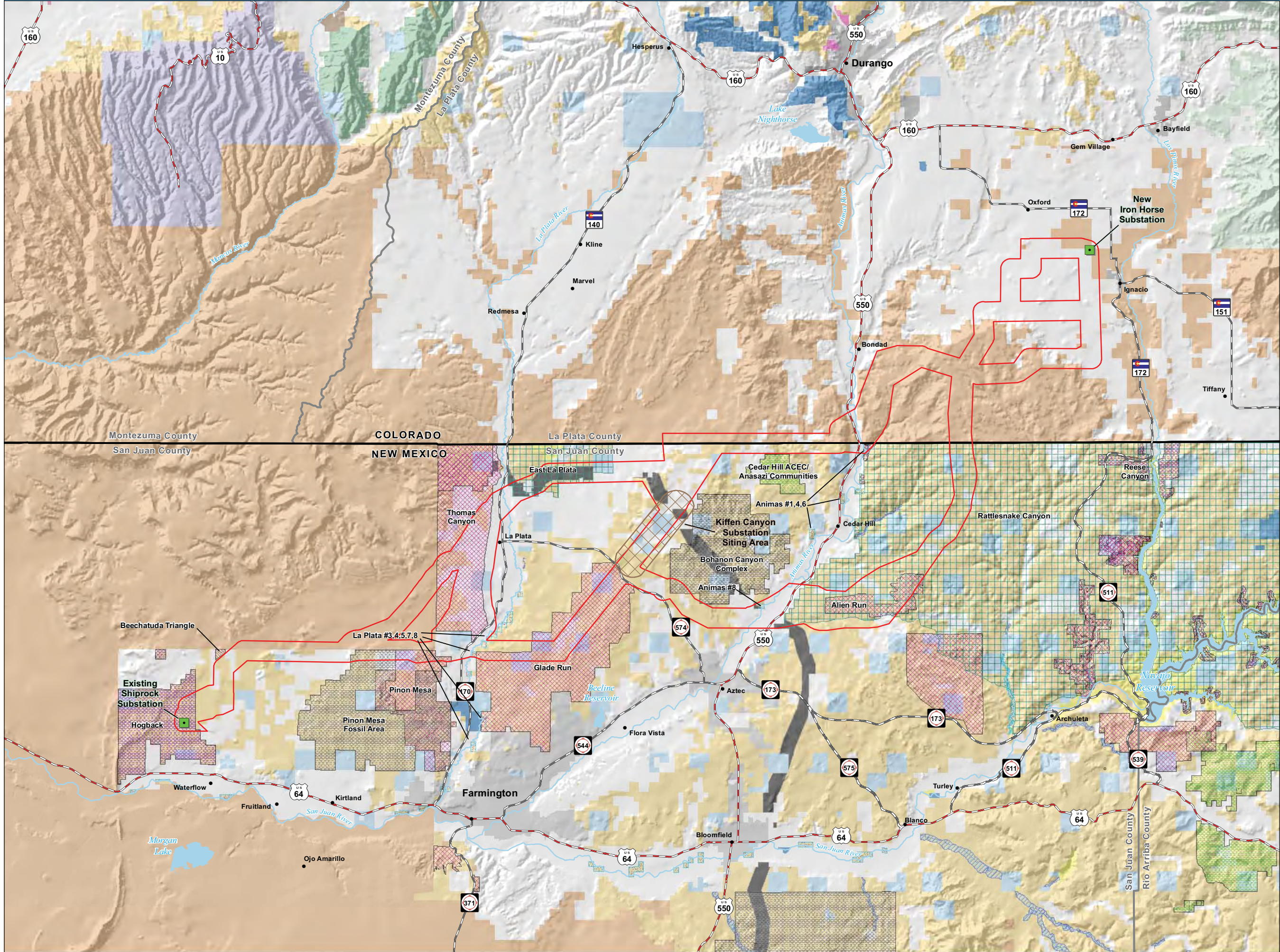
* Preliminary alternative corridors are subject to revision and may be added or removed.

0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

Date: September 2, 2010
Name: Geology
Location: P14074_San_Juan_BasinGIS/Map/Resource_Maps
Source: BTS, USGS, NHD

Vicinity Map





Jurisdiction

Legend

- Municipal Boundary
- West-Wide Energy Corridor

Project Features

- Project Substation
- Preliminary Alternative Corridors*
- Kiffen Canyon Substation Siting Area

BLM Special Designated Areas

- Riparian
- Geology
- Paleontology
- Recreation
- T&E Species
- Wildlife
- Riparian/T&E
- Cultural

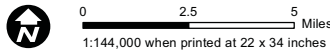
Colorado Jurisdiction

- Bureau of Land Management
- BLM Wilderness Study Area
- Bureau of Reclamation
- Municipality
- National Park Service
- State of Colorado
- State Wildlife Area
- Bureau of Indian Affairs
- U.S. Forest Service
- Conservation Easement

New Mexico Jurisdiction

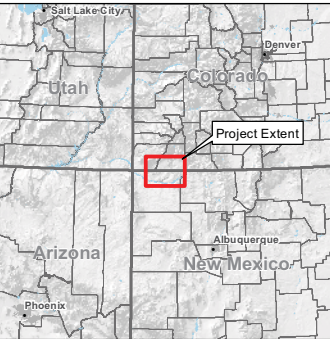
- Bureau of Land Management
- Bureau of Reclamation
- Bureau of Indian Affairs
- National Park Service
- State of New Mexico
- New Mexico Game and Fish

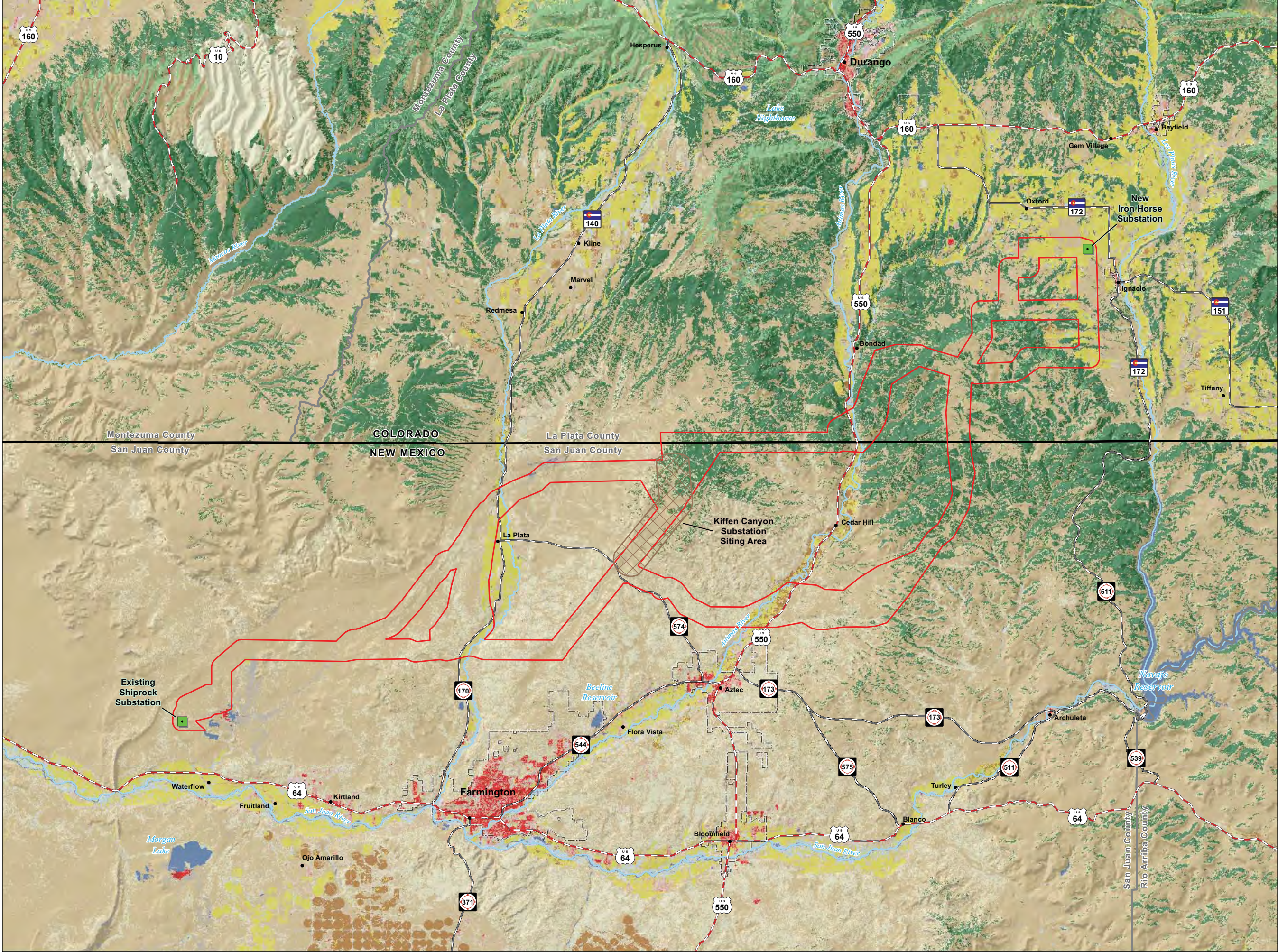
* Preliminary alternative corridors are subject to revision and may be added or removed.



Date: April 13, 2011
Name: Jurisdiction
Location: P:\4074_San_Juan_Basin\GIS\Map\Route_Refinement_Report
Source: BTS, USGS, NHD, CSU, BLM

Vicinity Map





Land Cover

Legend

Municipal Boundary

Project Features

- Project Substation
- Preliminary Alternative Corridors*
- Kiffen Canyon Substation Siting Area

Land Cover

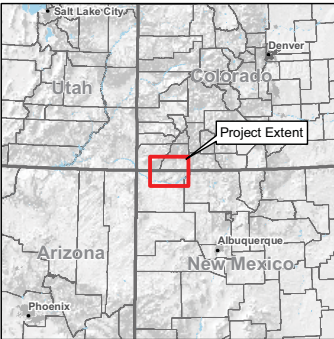
- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

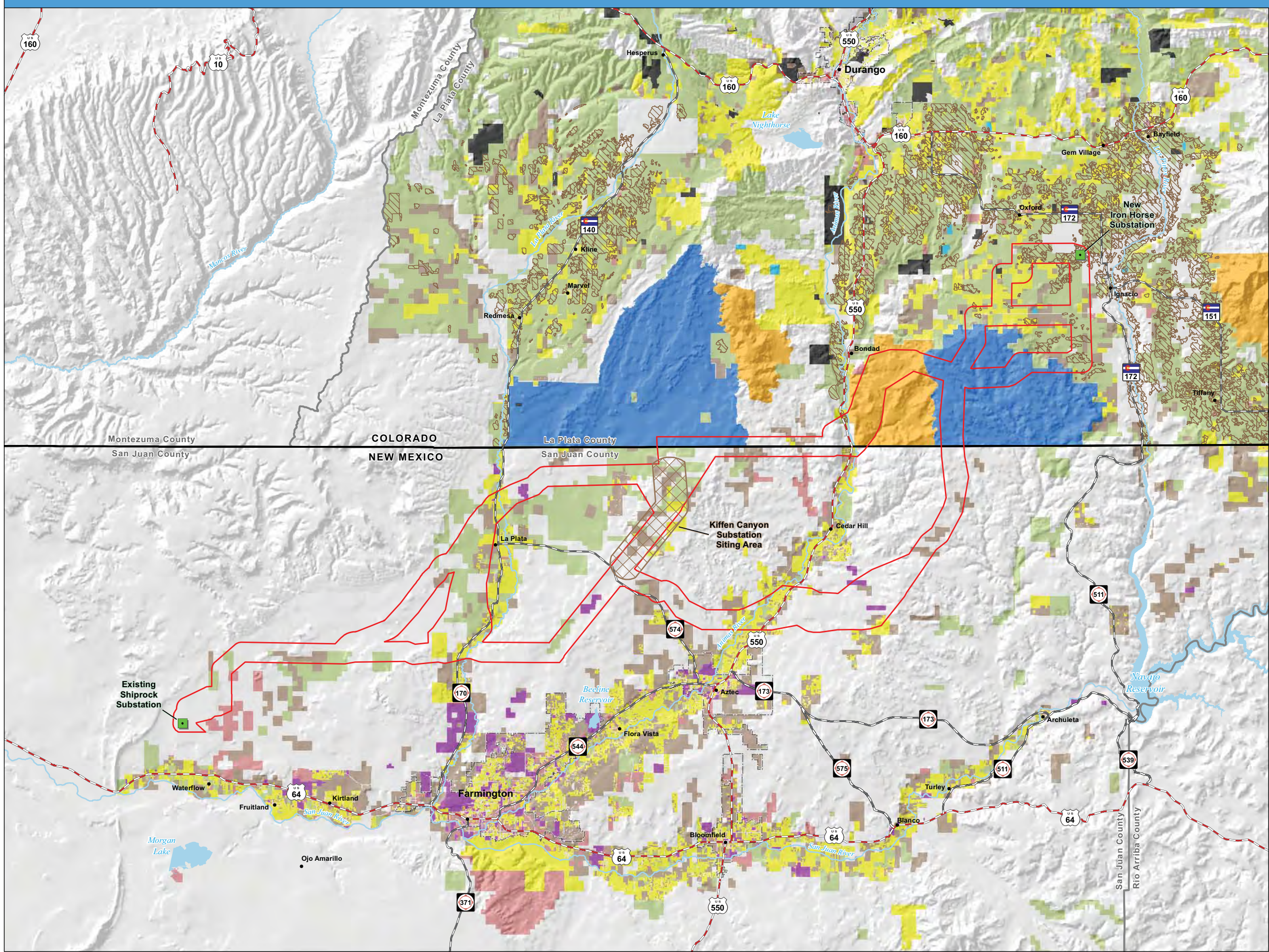
* Preliminary alternative corridors are subject to revision and may be added or removed.

0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

Date: September 2, 2010
Name: Land_Cover
Location: P14074_San_Juan_Basin\GIS\MapResource_Maps
Source: BTS, USGS, NHD, NLCD

Vicinity Map





Land Use

Legend

Municipal Boundary

Project Features

- Project Substation
- Kiffen Canyon Substation Siting Area
- Preliminary Alternative Corridors*

La Plata County Land Use

- Agricultural
- Commercial
- Industrial
- Residential
- Vacant
- Unknown

San Juan County Land Use

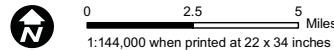
- Agricultural
- Commercial
- Exempt; Partial Exempt
- Residential
- Vacant Land

Southern Ute Indian Tribe

- Agricultural Land
- Range Land - Grazing
- Range Land - Wildlife Habitat

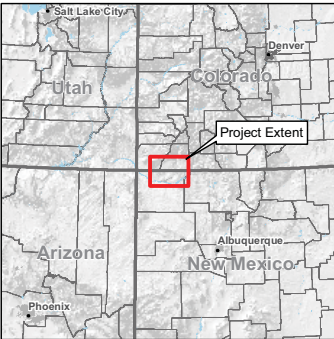
Note: Data derived from parcel data.

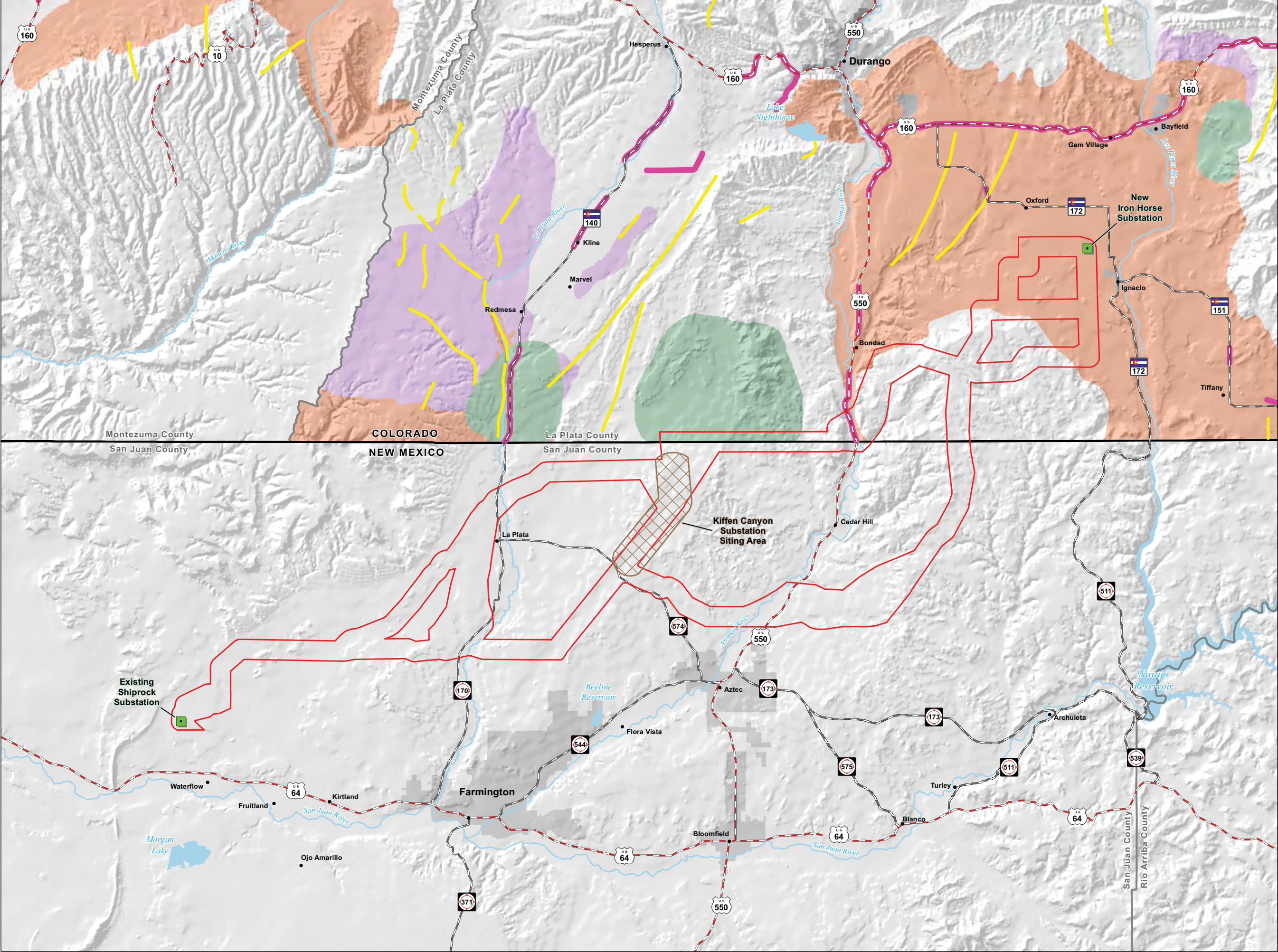
* Preliminary alternative corridors are subject to revision and may be added or removed.



Date: September 2, 2010
Name: Land Use
Location: P14074_San_Juan_Basin\GIS\Map\Resource_Maps
Source: BTS, USGS, NHD, San Juan Co, La Plata Co

Vicinity Map





Mule Deer Habitat

Legend

- Municipal Boundary
- Project Features**
 - Project Substation
 - Preliminary Alternative Corridors*
 - Kiffen Canyon Substation Siting Area
- Mule Deer Habitat**
 - Migration Pattern
 - Highway Crossings
 - Concentration Area
 - Severe Winter Range
 - Winter Concentration

* Preliminary alternative corridors are subject to revision and may be added or removed.

0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

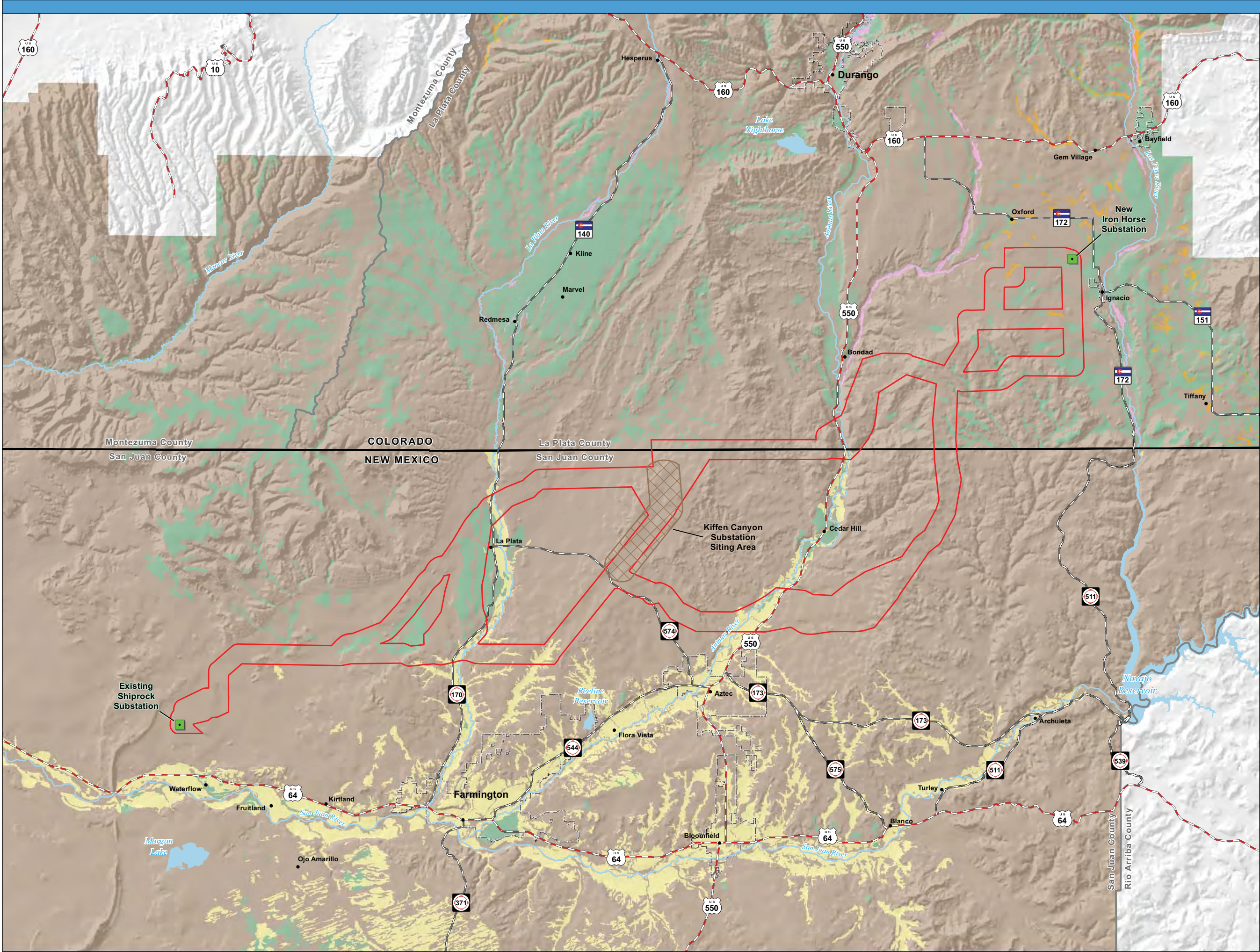
Date: September 2, 2010
Name: Mule Deer
Location: P14074_San_Juan_Basin\GIS\Map\Resource_Maps
Source: BTS, USGS, NHD, CDOW

Vicinity Map

TRI-STATE
Generation and Transmission
Association, Inc.
A Touchstone Energy Cooperative

TETRA TECH EC, INC.

San Juan Basin Energy Connect



Prime Farmland

Legend

Municipal Boundary

Project Substation

Preliminary Alternative Corridors*

Kiffen Canyon Substation Siting Area

Prime Farmland

Prime farmland if irrigated

Farmland of statewide importance

Prime farmland if irrigated and drained

Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

Not prime farmland

No Data

* Preliminary alternative corridors are subject to revision and may be added or removed.

02.55

Miles

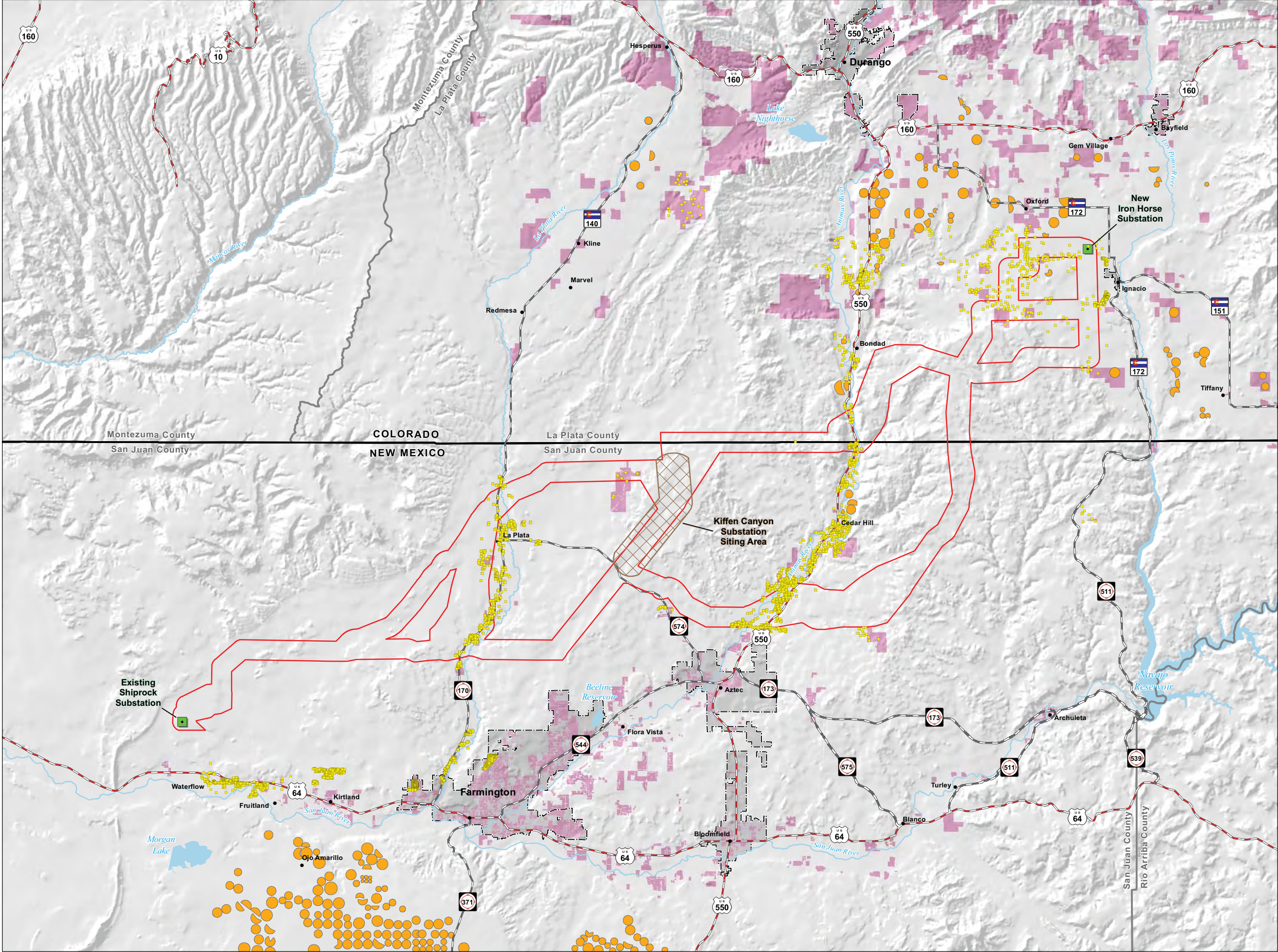
1:144,000 when printed at 22 x 34 inches

Date: September 2, 2010
Name: Prime_Farmland
Location: P14074_San_Juan_Basin\GIS\MapResource_Maps
Source: BTS, USGS, NHD, NRCS



TRI-STATE
Generation and Transmission
Association, Inc.
A Touchstone Energy Cooperative

TETRA TECH EC, INC.



Sensitive Land Uses

- Legend**
- Residence*
 - Pivot Irrigation*
 - Subdivision
 - Municipal Boundary
- Project Features**
- Project Substation
 - Preliminary Alternative Corridors*
 - Kiffen Canyon Substation Siting Area

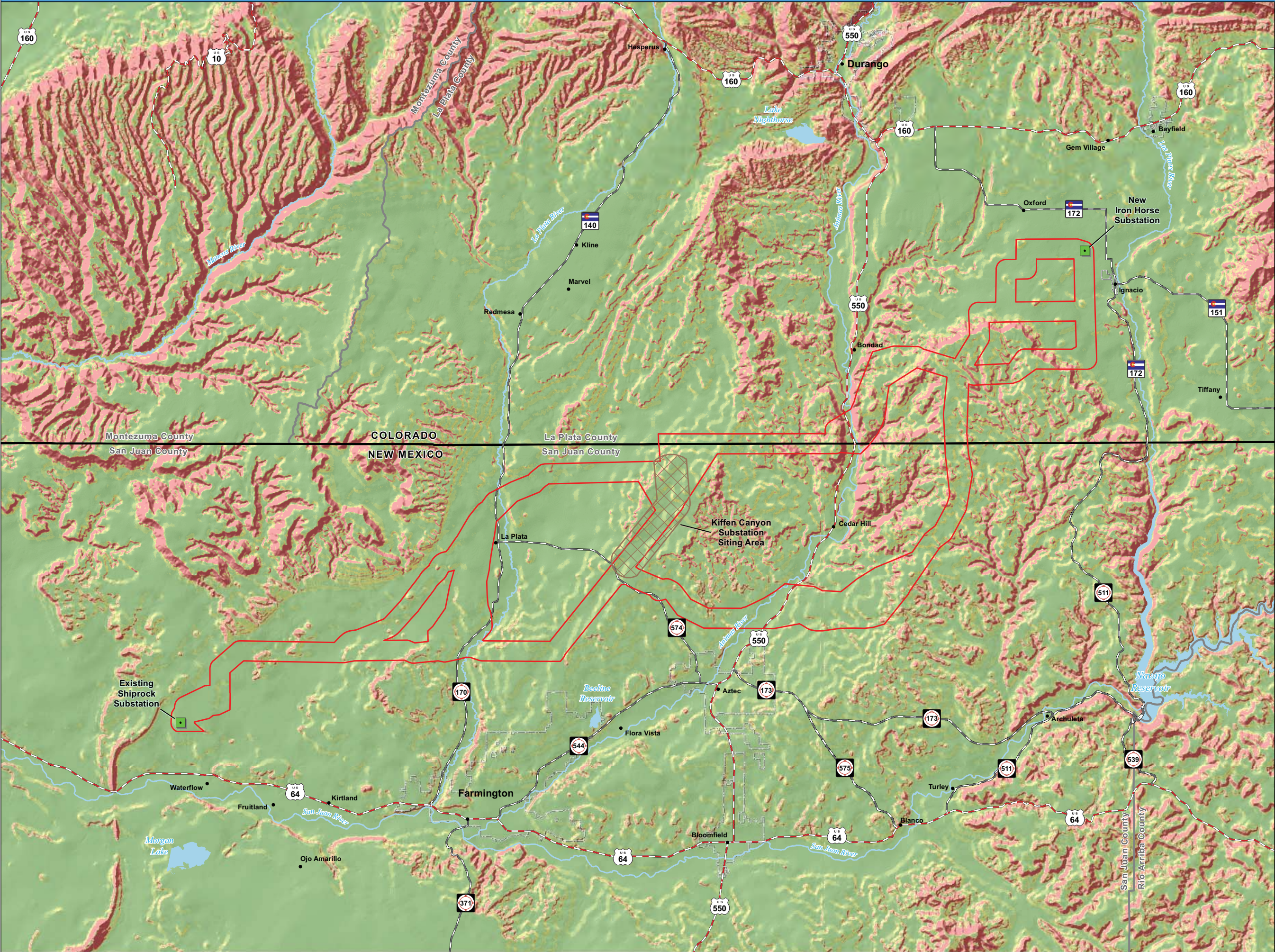
* Digitized from aerial within 1-mile of corridor boundaries

** Preliminary alternative corridors are subject to revision and may be added or removed.

0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

Date: September 2, 2010
Name: Sensitive_Land_Uses
Location: P:\4074_San_Juan_Basin\GIS\Map\Route_Refinement_Report
Source: BTS, USGS, NHD





Slope

Legend

- Municipal Boundary
- Project Features**
 - Project Substation
 - Preliminary Alternative Corridors*
 - Kiffen Canyon Substation Siting Area
- Slope (%)**
 - < 5
 - 5 - 10
 - 10 - 15
 - 15 - 20
 - > 20

* Preliminary alternative corridors are subject to revision and may be added or removed.

0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

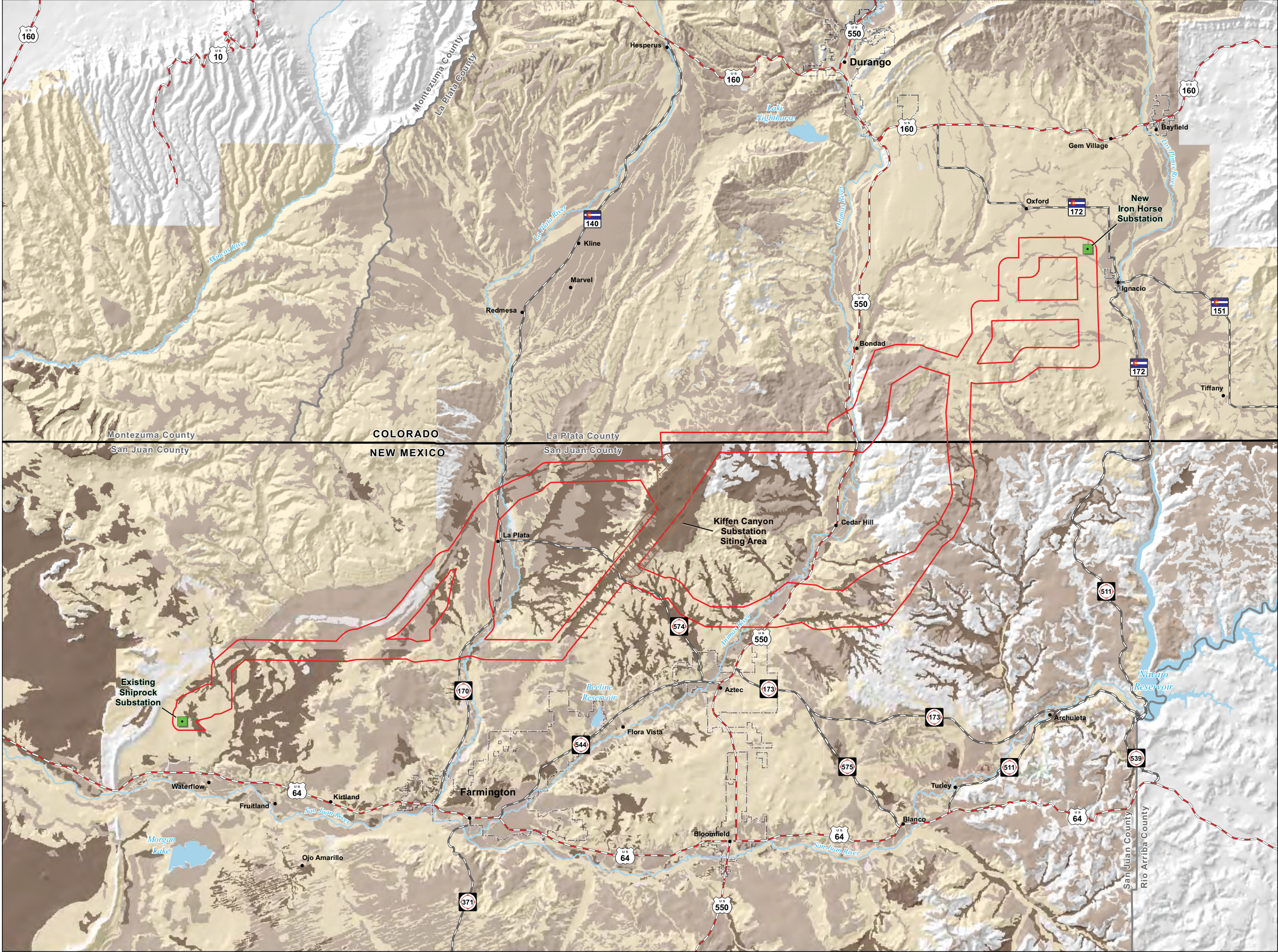
Date: September 2, 2010
Name: Slope
Location: P14074_San_Juan_Basin\GIS\Map\Resource_Maps
Source: BTS, USGS, NHD

Vicinity Map

TRI-STATE
Generation and Transmission
Association, Inc.
A Touchstone Energy Cooperative

TETRA TECH EC, INC.

San Juan Basin Energy Connect



Soil Erodibility

Legend

- Municipal Boundary
- Project Features**
 - Project Substation
 - Preliminary Alternative Corridors*
 - Kiffen Canyon Substation Siting Area
- Soil Erodibility (kwfact)**
 - Low
 - Moderate
 - High
 - No Data

* Preliminary alternative corridors are subject to revision and may be added or removed.

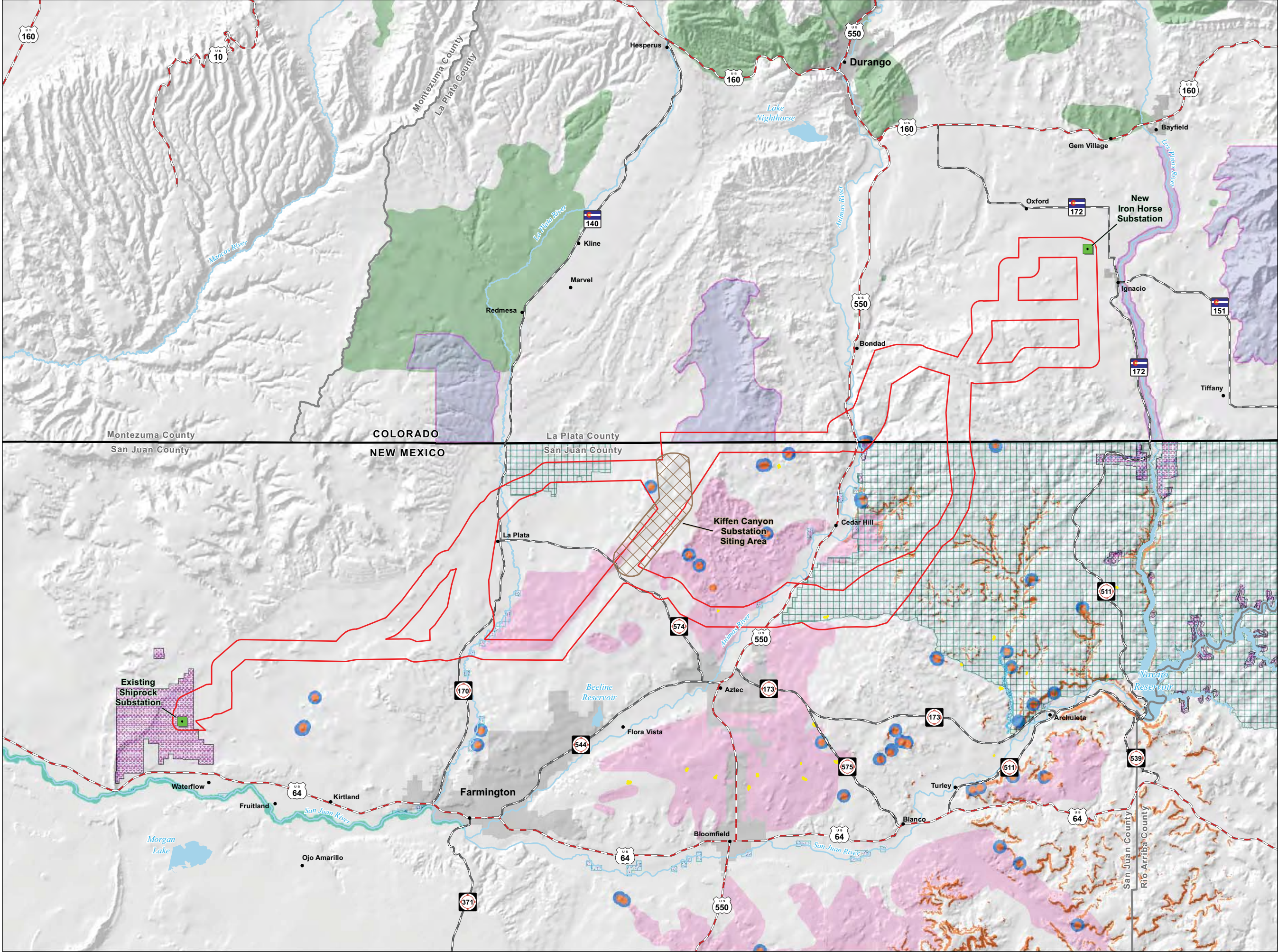
0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

Date: September 2, 2010
Name: Soil_Erodibility
Location: P14074_San_Juan_Basin\GIS\MapResource_Maps
Source: BTS, USGS, NHD, NRCS

Vicinity Map

TRI-STATE
Generation and Transmission
Association, Inc.
A Touchstone Energy Cooperative

TETRA TECH EC, INC.

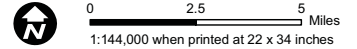


Wildlife & Plant Habitat

Legend

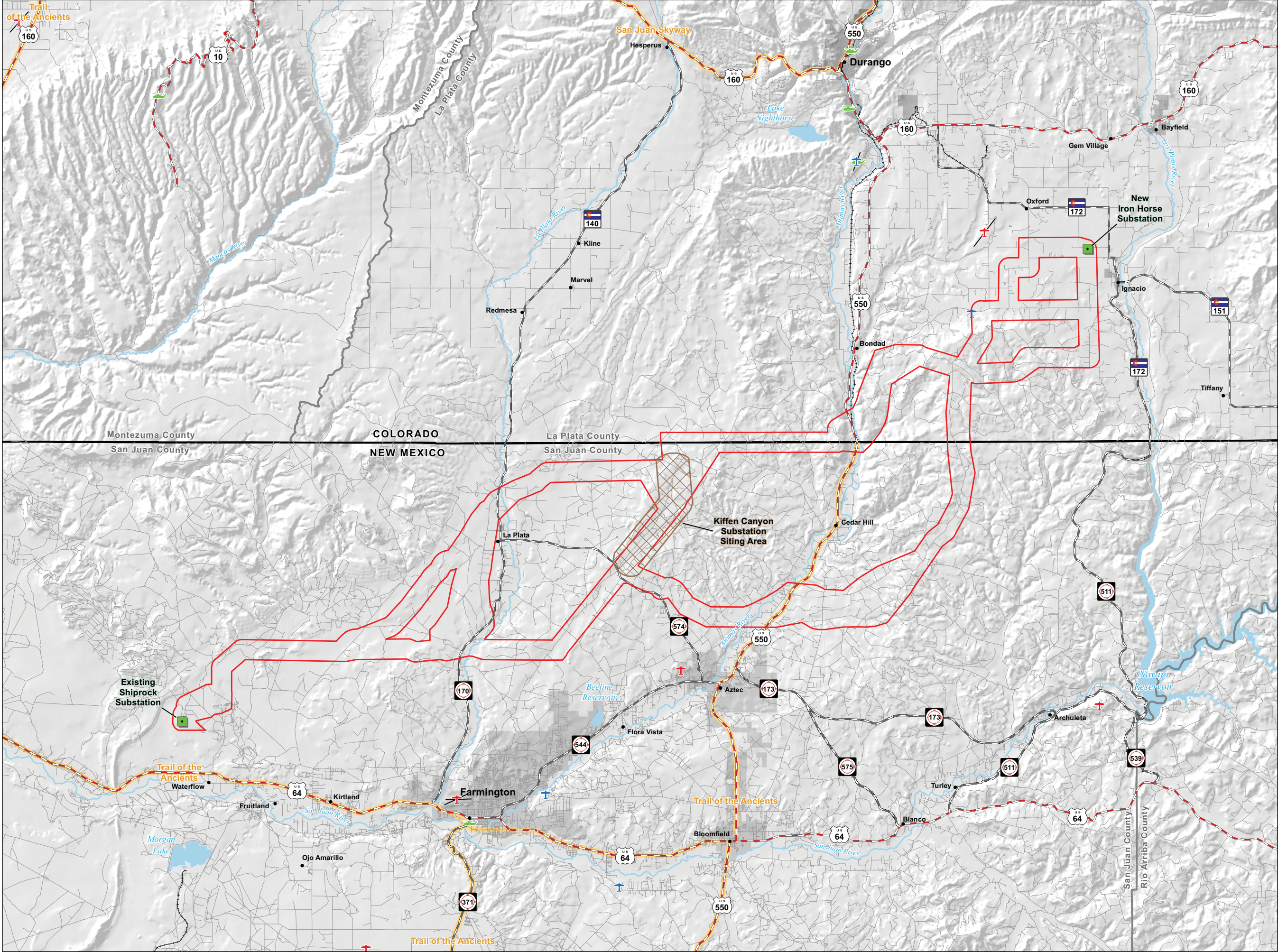
- Municipal Boundary
- Project Features**
 - Project Substation
 - Preliminary Alternative Corridors*
 - Kiffen Canyon Substation Siting Area
- Species Habitat**
 - Prairie Dog Habitat
 - Raptor Habitat
 - BLM Raptor Nest Buffer
 - Mountain Lion Human Conflict Area
 - Pikeminnow/Razorback Sucker Critical Habitat
 - Potential Aztec Gilia and Brack's Cactus Habitat
 - Calving Fawning Habitat
- BLM Special Designated Areas**
 - T&E Species
 - Wildlife
 - Riparian/T&E Species

* Preliminary alternative corridors are subject to revision and may be added or removed.



Date: September 2, 2010
Name: Species
Location: P14074_San_Juan_Basin\GIS\MapResource_Maps
Source: BTS, USGS, NHD, CDOW





Transportation

Legend

- Municipal Boundary
- Project Features**
 - Project Substation
 - Preliminary Alternative Corridors*
 - Kiffen Canyon Substation Siting Area
- Transportation**
 - Public Airport
 - Private Airport
 - Heliport
 - U.S. Highway
 - State Highway
 - County or Local Road
 - Railroad
 - Scenic Byway

* Preliminary alternative corridors are subject to revision and may be added or removed.

0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

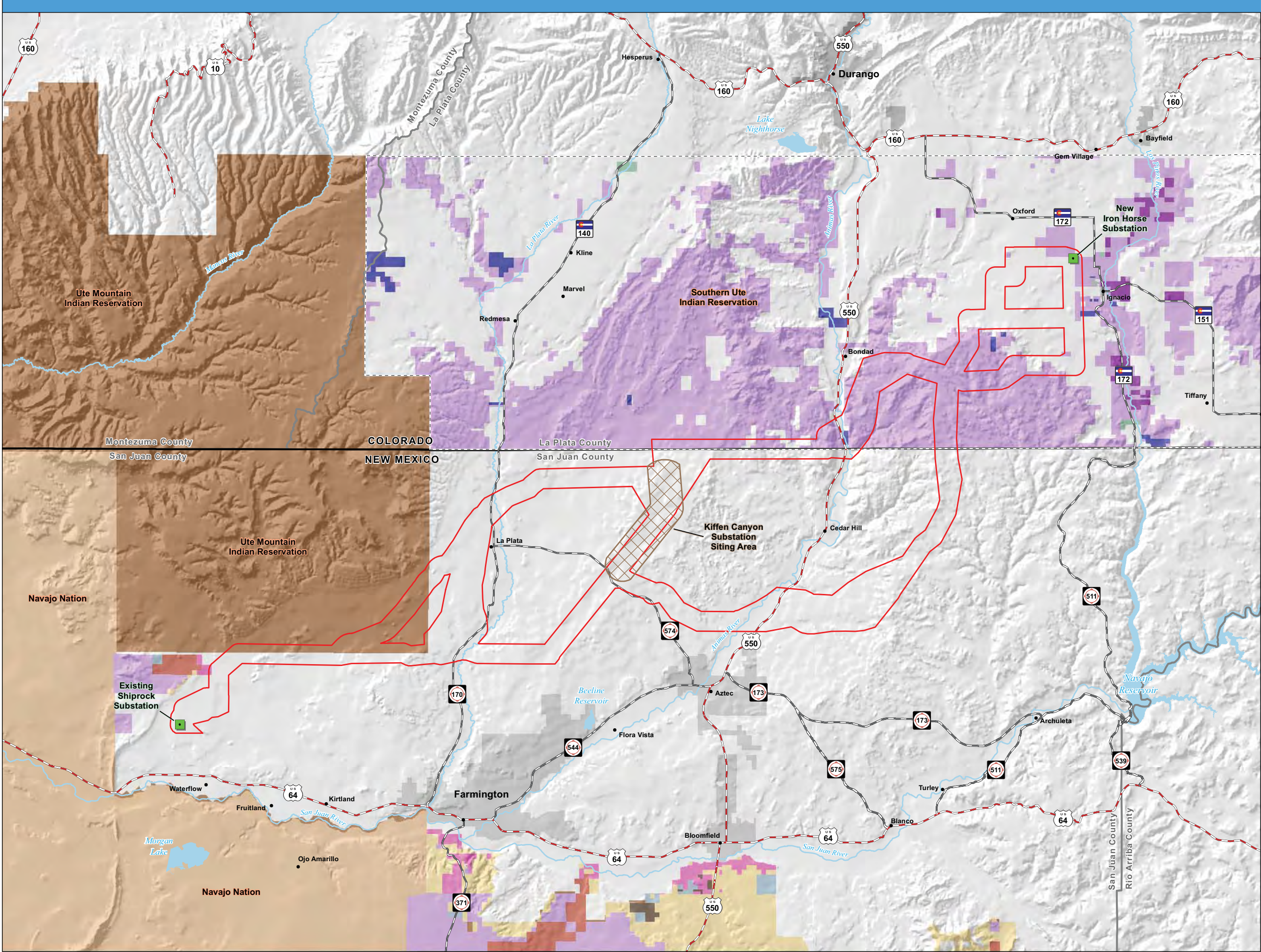
Date: September 2, 2010
Name: Transportation
Location: P14074_San_Juan_Basin\GIS\MapResource_Maps
Source: BTS, USGS, NHD, Census

Vicinity Map

TRI-STATE
Generation and Transmission
Association, Inc.
A Touchstone Energy Cooperative

TETRA TECH EC, INC.

San Juan Basin Energy Connect

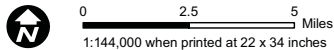


Tribal Jurisdiction

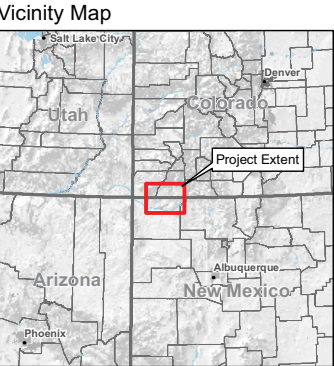
Legend

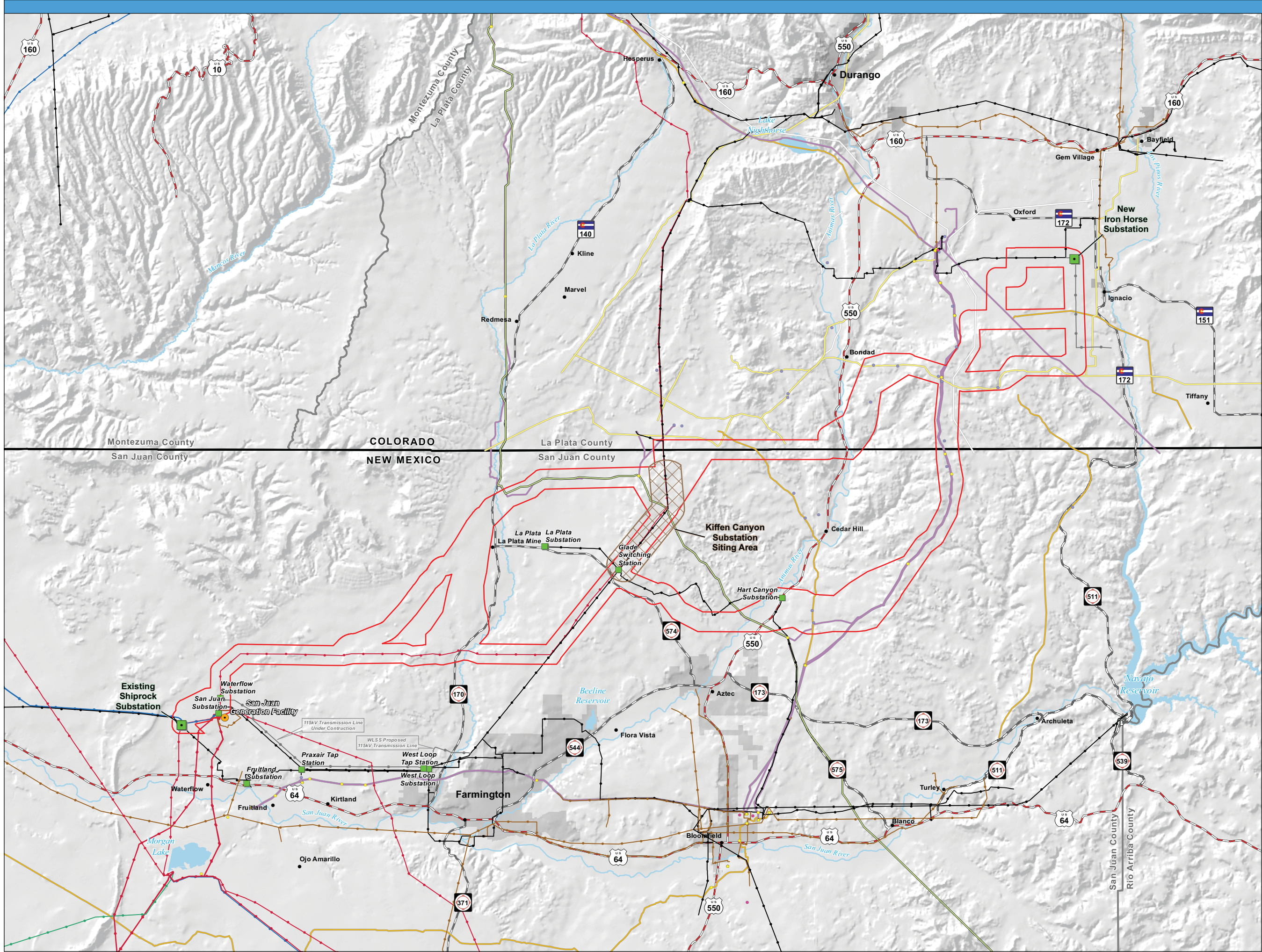
- Municipal Boundary
- Project Features**
 - Project Substation
 - Preliminary Alternative Corridors*
 - Kiffen Canyon Substation Siting Area
- Southern Ute Indian Tribe (SUIT)**
 - SUIT Reservation Boundary
 - Recently Purchased Property
 - Joint Interest Land
 - Southern Ute Allotted Land
 - Southern Ute Tribal Trust Land
- Ute Mountain Ute Jurisdiction**
 - Ute Mountain Indian Reservation
- Navajo Jurisdiction**
 - Bureau of Land Management
 - Navajo Allotted Land
 - Navajo Indian Reservation
 - Navajo Tribal Fee
 - Navajo Tribal Trust
 - Private
 - State of New Mexico

* Preliminary alternative corridors are subject to revision and may be added or removed.



Date: September 2, 2010
Name: Tribal_Jurisdiction
Location: P14074_San_Juan_Basin\GIS\MapResource_Maps
Source: BTS, USGS, NHD, Navajo





Utilities

Legend

- Municipal Boundary

Project Features

- Project Substation
- Preliminary Alternative Corridors*
- Kiffen Canyon Substation Siting Area

Existing Transmission

- Substation
- Generation Facility
- 46-69kV Transmission Line
- 115kV Transmission Line
- 230kV Transmission Line
- 345kV Transmission Line
- 500kV Transmission Line

Pending Transmission

- Proposed or Under Construction 115kV Transmission Line

Existing Gas Line

- Receipt Delivery Points
- Natural Gas Processing Plant
- Pipeline Support Facility
- 2'-8" Diameter Gas Pipeline
- 12'-26" Diameter Gas Pipeline
- Unknown Gas Pipeline Diameter
- Pipeline Partially Confirmed on Aerial

Other Pipeline

- 30" Diameter Co² Pipeline

* Preliminary alternative corridors are subject to revision and may be added or removed.

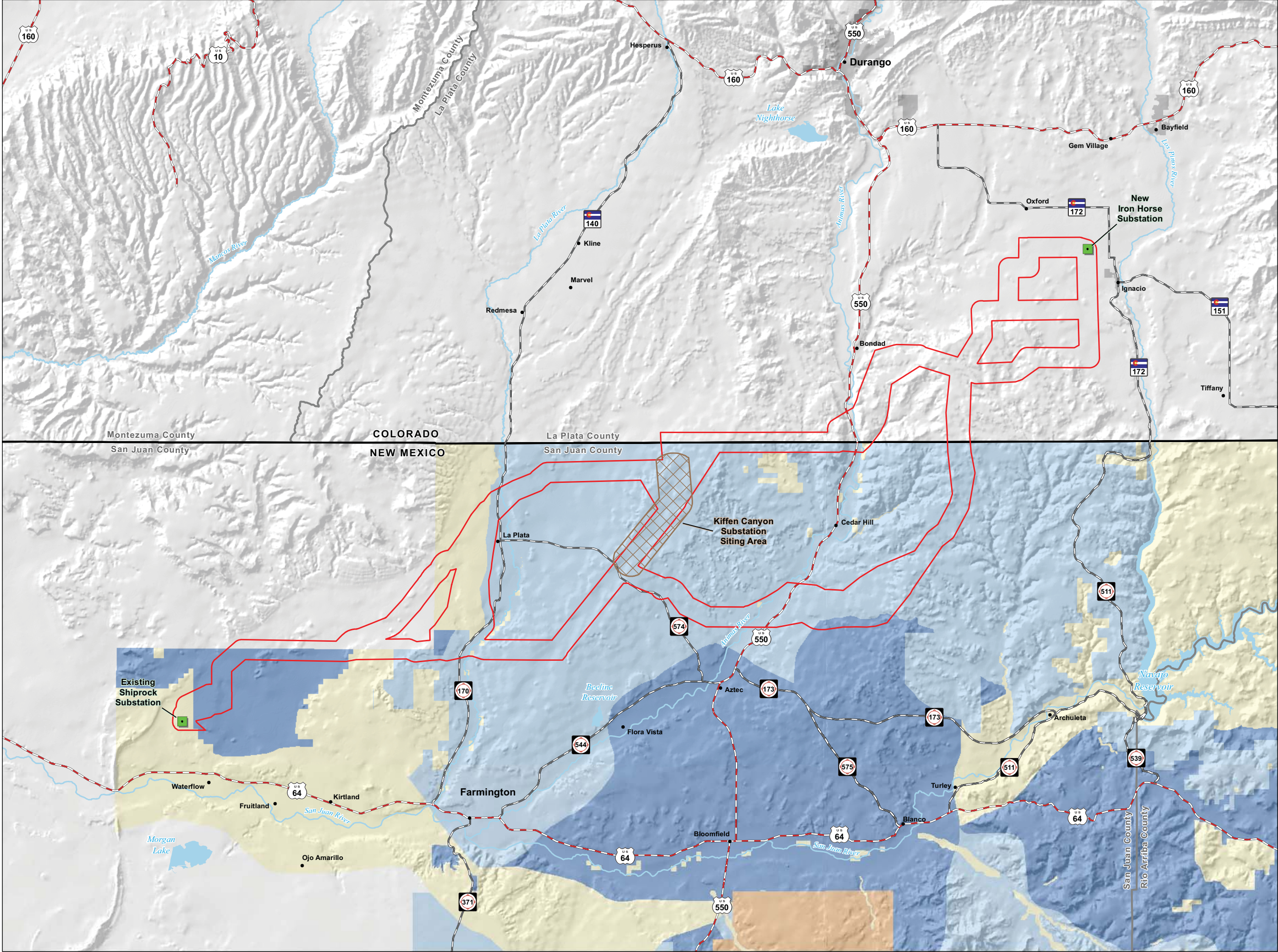
0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

Date: April 12, 2011
Name: Utilities
Location: P:\4074_San_Juan_Basin\GIS\Map\Route_Refinement_Report
Source: BTS, USGS, NHD, WAPA, LPEA, PNM, Tri State, FEUS, Ventyx and COGS

Vicinity Map

TRI-STATE
Generation and Transmission Association, Inc.
A Touchstone Energy Cooperative

TETRA TECH EC, INC.



Visual Resource Management

Legend

Municipal Boundary

Project Features

- Project Substation
- Preliminary Alternative Corridors*
- Kiffen Canyon Substation Siting Area

Visual Resource Management

- Class I
- Class II
- Class III
- Class IV

* Preliminary alternative corridors are subject to revision and may be added or removed.

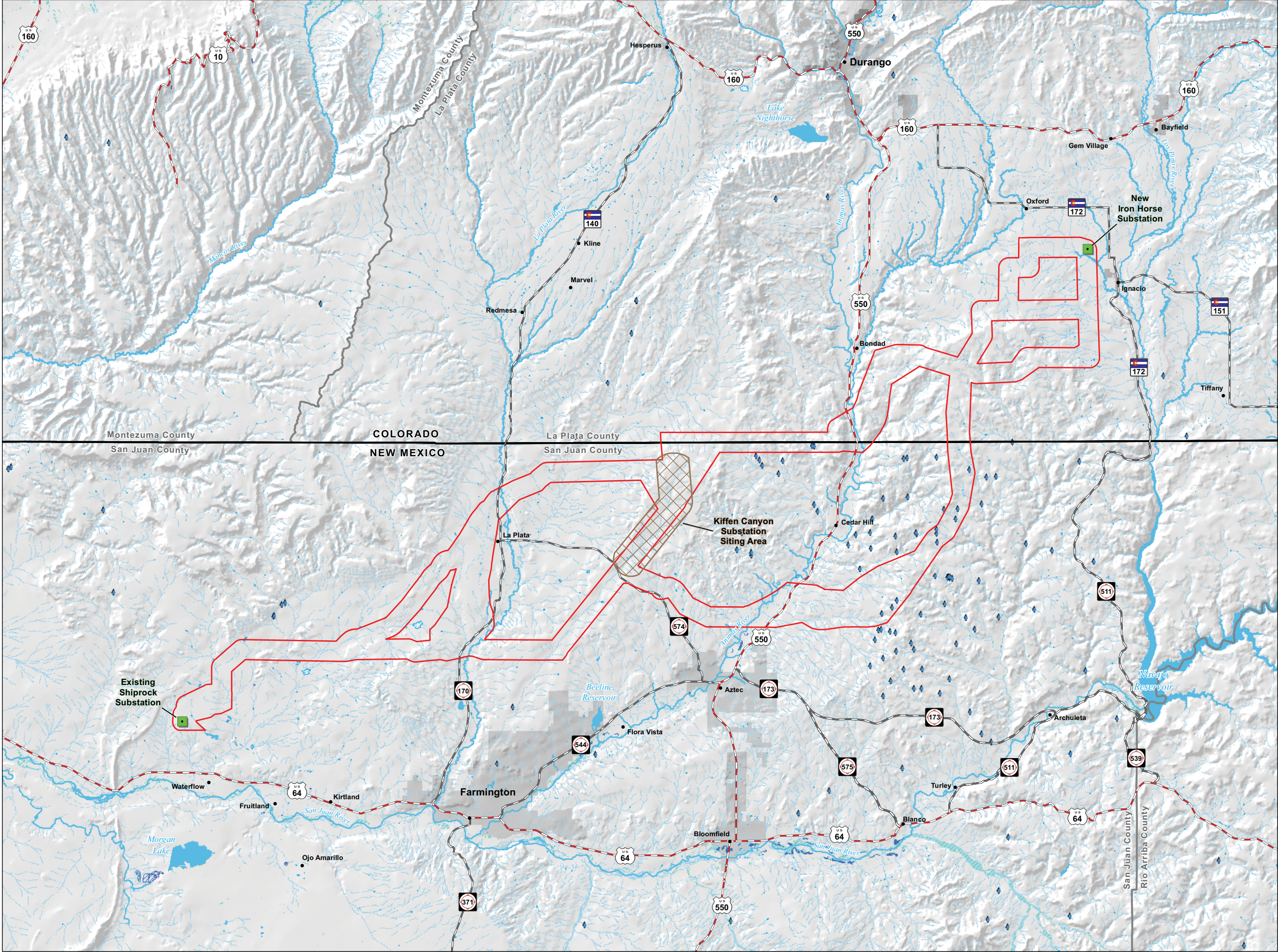
0 2.5 5 Miles
1:144,000 when printed at 22 x 34 inches

Date: September 2, 2010
Name: VRM
Location: P14074_San_Juan_Basin\GIS\Map\Resource_Maps
Source: BTS, USGS, NHD, and FFO

Vicinity Map

TRI-STATE
Generation and Transmission
Association, Inc.
A Touchstone Energy Cooperative

TETRA TECH EC, INC.



Water Resources

Legend

■ Municipal Boundary

Project Features

- Project Substation
- ▭ Preliminary Alternative Corridors*
- ▭ Kiffen Canyon Substation Siting Area

Water Resources

- ◆ Spring
- Perennial Stream
- - - Intermittent Stream
- - - Canal or Ditch
- Perennial Lake
- Intermittent Lake
- ▨ Reservoir
- Swamp/Marsh
- ▨ Wetland

* Preliminary alternative corridors are subject to revision and may be added or removed.

0 2.5 5 Miles

1:144,000 when printed at 22 x 34 inches

Date: September 2, 2010
Name: Water_Resources
Location: P14074_San_Juan_Basin\GIS\Map\Resource_Maps
Source: BTS, USGS, NHD, NWI

Vicinity Map

TRI-STATE
Generation and Transmission
Association, Inc.
A Touchstone Energy Cooperative

TETRA TECH EC, INC.

Appendix C: BLM Corridor and Route Segment Comments—June 2010

San Juan Basin Energy Connect
Route Refinement Report

This page intentionally left blank.

Appendix C—BLM Corridor and Route Segment Comments—June 2010

Resource Specialist	Preferred Route	Prefer not Routing Thru These Corridors	Comment
Riparian Specialist	HH, LL, KK, G, I then either S or P-Old Mine Road		No fatal flaws as far as riparian resources except to follow existing disturbance.
T&E Biologist	B, E, or B, HH, LL	Route A, goes right through prime (and occupied) Mesa Verde cactus habitat (a federally endangered species), and would add another layer of work, mainly Sec. 7 consultation with US Fish and Wildlife Service, who may ask for a re-route. The MV cactus population on BLM is already hurting and the A route would undoubtedly reduce their prime habitat more.	
Wildlife Biologist	A, UU, D, H, I, ST, U, X, EE, CC, AA	Once the line passes a short distance beyond the intersection of VV/I the BLM has little to say in the matter. However, up to that point the route follows a highly disturbed area that already has other power lines in it. Two of the other potential routes cross the Rattlesnake Canyon Wildlife SDA. It would be my preference that we limit the further fragmentation of this area by not constructing this power line in either M or N.	
Archeologist	MM, F, H, keep it next to an existing line. Route M goes up the Arkansas loop, that seems reasonable.		
Recreation	HH, LL, MM, F, H, I, with H being parallel to the existing power line and not down County Road 1980.	UU - Cuts through Pinion Mesa Rec. Area near both main entrances off of La Plata highway and Pinon Hills. MM - Cuts across the top of Pinion Mesa, D and H Bisects the Glade and goes through a major (and unique) rock crawling area. TT and KK both bisect Thomas Canyon Rec. and Wildlife Areas. This area is supposed to be maintained for primitive uses, limited oil and gas ROW on existing leases. VRM class II or I (original acres) and maintain natural values. L - Cuts the top half of Alien Run rec area including bisecting new trail from existing trail.	
Paleontologist		UU and MM go thru Pinion Mesa SDA for Paleo.	
Mining Engineer		Prefer exclusion of routing on reclaimed mine land	
Range	HH, LL, KK, G, I then either S or P-Old Mine Road		

Appendix D: Comparative Route Segment Matrix

San Juan Basin Energy Connect
Route Refinement Report

This page intentionally left blank.

Appendix D—Comparative Route Segment Matrix

Route Segment	7	8	9	10	11	12	13	15	17	21	22	23	24	26	27	28	29	30	32	37	40	42	43	44	45	46	47	48	49	51	52	53	54	55
ENGINEERING FACTORS																																		
Overall Length (miles)	5.50	5.10	2.84	4.70	0.36	5.85	5.90	6.14	4.49	1.58	1.13	2.07	1.65	8.88	4.35	1.65	4.82	1.19	1.97	8.49	3.89	2.94	1.24	4.97	9.52	3.65	6.45	2.94	5.20	2.42	1.43	3.65	3.27	17.84
Number of Transmission Line Crossings	2.00	0	0	0	0	1.00	0	1.00	0	0	1.00	1.00	0	0	0	0	1.00	0	0	0	0	0	0	0	0	0	0	0	1.00	2.00	2.00	1.00	1.00	0
Number of Railroad Crossings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Road Crossings	7.00	3.00	2.00	6.00	0	5.00	6.00	9.00	3.00	1.00	4.00	0	3.00	14.00	7.00	2.00	8.00	1.00	4.00	14.00	6.00	4.00	1.00	12.00	17.00	11.00	5.00	7.00	4.00	4.00	0	6.00	9.00	24.00
Length Adjacent to (within 200 ft) State Highways (miles)	0	0	0	0	0	0.07	0	0	0	0	0.08	0	0	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length Adjacent to (within 200 ft) U.S. Highways (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	0	0	0	0	0	0	0	0	0	0	0	0.07	0.07	0
Length Adjacent to (within 200 ft) County and Local Roads (miles)	0.57	1.13	0.24	0.50	0	0.46	0.97	2.50	0.21	0.06	0.34	0	0.23	1.53	0.69	0.16	0.74	0.09	0.32	1.40	1.98	0.29	0.08	1.91	2.66	3.65	2.39	1.11	0.56	0.29	0	0.58	1.63	2.32
Length Adjacent to (within 200 ft) Existing Railroads (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length Adjacent to (within 200 ft) Existing Parcel Boundaries (miles)	0.46	3.38	0.11	0.36	0.36	3.14	0.20	2.52	1.26	0.29	0	0	0.32	2.76	0.93	0.91	0.94	0.22	0.79	2.58	0	0	0	2.04	3.92	3.65	5.24	2.54	0.54	0.36	0	2.22	1.88	1.00
Length Adjacent to (within 200 ft) Existing Transmission Line (miles)	4.40	5.10	0.00	4.70	0.36	5.85	0	0.10	3.68	0	0.64	0.20	0.01	0	2.56	1.22	0.58	0.91	0	0	0	0	0	0	0	0	2.53	0	4.14	0.15	0.08	0.11	0.08	0
Length Adjacent to (within 200 ft) Existing Gas Pipelines (miles)	0	0	0.14	0.11	0.17	0.62	0.17	0.42	0.35	0	0	0	0	3.20	0.37	0.16	0.28	0.09	0.47	1.87	2.65	0.17	0.17	0.35	0.40	2.14	0.45	1.47	0	0.37	0.09	0.19	0.42	3.34
Length Adjacent to (within 700 ft) Existing Gas Pipelines (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	7.02	0.28	0.01	0	0	0	0.33	0.05	2.94	0.39	0	5.85	1.25	0.27	0.27	0	2.42	0.25	0.31	1.45	3.46
Total Segment Length Adjacent to Existing Linear Features (except parcels) (miles) (GL 200 ft)	1.00	1.13	0.38	0.58	0.17	1.02	1.08	2.74	0.56	0.06	0.41	0.58	0.23	4.46	0.84	0.18	0.93	0.09	0.71	2.57	2.84	0.40	0.18	2.20	2.69	3.65	2.82	2.05	0.56	0.58	0.09	0.75	1.83	4.71
Adjacency to Existing Linear Features (except parcels) (% of Overall Length) (GL 200 ft)	18.20%	22.09%	13.34%	12.37%	46.79%	17.49%	18.25%	44.53%	12.51%	3.50%	36.32%	28.24%	13.74%	50.18%	19.20%	10.95%	19.38%	7.50%	36.20%	30.25%	73.07%	13.69%	14.27%	44.25%	28.25%	100.00%	43.65%	69.66%	10.75%	24.10%	6.43%	20.62%	56.16%	26.41%
Total Segment Length Adjacent to Existing Linear Features (except parcels) (miles) (GL 700 ft)	4.50	5.10	0.24	4.70	0.36	5.85	0.97	2.60	3.68	0.06	0.97	0.61	0.24	7.48	3.34	1.30	1.20	0.91	0.32	1.73	1.98	2.94	0.39	1.91	7.10	3.65	4.74	1.11	4.56	2.42	0.33	0.88	2.60	5.49
Adjacency to Existing Linear Features (except parcels) (% of Overall Length) (GL 700 ft)	81.82%	100.00%	8.44%	100.00%	100.00%	100.00%	16.50%	42.35%	82.02%	3.50%	85.37%	29.62%	14.52%	84.30%	76.79%	78.93%	25.01%	76.52%	16.38%	20.39%	50.82%	100.00%	31.53%	38.39%	74.63%	100.00%	73.48%	37.86%	87.83%	100.00%	23.37%	24.18%	79.69%	30.79%
Total Segment Length Adjacent to Existing Linear Features (including parcels/700 ft pipeline) (miles)	4.50	5.10	0.35	4.70	0.36	5.85	1.11	3.97	3.89	0.35	0.97	1.10	0.42	8.31	3.42	1.39	2.00	0.97	0.97	3.24	1.98	2.94	0.39	2.44	8.88	3.65	6.35	2.54	4.58	2.42	0.62	2.49	2.81	6.30
Adjacency to Existing Linear Features (% of Overall Length)	81.82%	100.00%	12.23%	100.00%	100.00%	100.00%	18.86%	64.61%	86.53%	22.03%	85.37%	52.96%	25.49%	93.65%	78.65%	84.37%	41.45%	81.88%	49.46%	38.18%	50.82%	100.00%	31.53%	49.05%	93.28%	100.00%	98.38%	86.58%	88.17%	100.00%	43.11%	68.15%	85.93%	35.33%
Length Crossing Slope <10% (miles)	5.50	4.89	2.84	3.94	0.25	5.63	5.61	5.50	4.49	1.58	1.13	0	1.54	8.65	4.35	1.39	4.64	0.80	1.59	4.64	2.24	2.13	0.61	3.57	6.44	3.65	6.45	2.94	4.30	2.08	0	3.58	3.12	14.98
Length Crossing Slope 10–25% (miles)	0	0.13	0	0.63	0.09	0.14	0.21	0.57	0	0	0	0	0.04	0.14	0	0.13	0.11	0.29	0.07	2.07	1.18	0.55	0.56	0.87	2.13	0	0	0	0.47	0.18	0	0.07	0.11	2.02
Length Crossing Slope >25% (miles)	0	0.07	0	0.07	0	0	0.00	0	0	0	0	0	0	0.06	0	0	0	0	0	1.35	0.11	0.13	0	0.29	0.60	0	0	0	0.35	0.11	0	0	0	0.25
LAND USE FACTORS																																		
Jurisdiction																																		
Length Crossing BLM-managed land (miles)	5.17	2.43	0	2.02	0	3.94	1.84	0.95	3.98	0.72	1.13	1.54	1.03	3.69	1.06	0.01	4.31	0.79	0.79	4.39	0	0	0	0	0	0	0	0	2.58	1.49	0.24	0.38	0.98	11.04
Length Crossing BLM-managed SDAs or ACECs (miles)	0.79	0	0	4.04	0	1.61	2.53	4.77	4.49	1.58	0.55	0.80	0	5.48	0	0	0.53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.38	0.48	13.90
Length Crossing Southern Ute Indian Reservation (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.92	3.89	2.94	1.24	3.10	4.47	0	0	0	0	0	0	0	0	3.94
Length Crossing State-managed Land in New Mexico (miles)	0	0.25	0	1.02	0	0.58	0	0.77	0.44	0	0	0	0	0.98	1.66	0	0	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	1.49	
Length Crossing Private Land (miles)	0.33	2.41	0.13	1.66	0.36	1.33	0.69	4.42	0.07	0.86	0	0.53	0.62	4.21	1.63	1.64	0.50	0.40	1.18	2.16	0	0	0	1.88	5.05	3.65	6.45	2.94	2.36	0.93	1.19	3.27	2.28	1.37
Land Cover																																		
Length Crossing Open Water (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0.04	0
Length Crossing Developed, Open Space (miles)	0	0	0	0	0	0	0	0	0	0	0.05	0	0	0.31	0	0	0	0	0	0.02	0	0	0	0	0.09	0	0.17	0	0	0	0	0.05	0.08	0
Length Crossing Developed, Low Intensity (miles)	0	0	0	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0	0.25	0.15	0.79	0.50	0.04	0	0	0	0.05	0.01	0
Length Crossing Developed, Medium Intensity (miles)	0.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0
Length Crossing Developed, High Intensity (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length Crossing Barren Land (miles)	0.30	0.08	0.22	0	0	0	2.97	0	0	0.44	0	0	0	0.58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.26	0	0	0	0	0
Length Crossing Deciduous Forest (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04	0	0	0	0.49	0.59	0	0	0	0	0	0	0	0	0
Length Crossing Evergreen Forest (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.19	0.65	0	0.55	1.51	3.63	2.28	2.02	0.18	1.67	3.34	0.25	0.38	0.18	0	0.37	0	0	0	4.54
Length Crossing Mixed Forest (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length Crossing Shrub/Scrub (miles)	4.41	4.42	2.15	3.63	0.33	3.10	2.40	3.90	3.55	1.07	0.82	0	1.18	6.01	3.58	0.93	1.75	0.57	0.40	4.10	1.61	0.91	1.06	2.50	3.78	2.27	2.60	2.05	4.13	1.69	0	1.46	0.80	12.21
Length Crossing Grassland/Herbaceous (miles)	0.65	0.59	0.47	1.07	0.03	2.44	0.54	2.24	0.94	0.07	0.26	0	0.47	1.73	0.58	0.06	3.04	0.06	0.06	0.54	0	0	0	0.02	0.10	0	0.13	0.04	0.81	0.37	0	0.80	0.96	1.08
Length Crossing Pasture/Hay (miles)	0	0	0	0	0	0.27	0	0	0	0	0	0	0	0.01	0	0	0	0	0	0.06	0	0	0	1.38	0.27	2.67	0.52	0	0	0	0.56	0.88	0	
Length Crossing Cultivated Crops (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.10	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0.39	0	
Length Crossing Woody Wetlands (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0.15	0	0	0	0	0	0.06	0	0	0	0.04	0.09	0.08	0	0.11	0	0	0	0.35	0.09	0

Appendix D—Comparative Route Segment Matrix

[illegible]

Appendix D—Comparative Route Segment Matrix

Route Segment	7	8	9	10	11	12	13	15	17	21	22	23	24	26	27	28	29	30	32	37	40	42	43	44	45	46	47	48	49	51	52	53	54	55	
Length Crossing Raptor Habitat (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Length Crossing Greenback Cutthroat Streams (miles)																																			
Length Crossing Pike Minnow and Razorback Sucker Habitat (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Length Crossing Aztec Gilia and Bracks Cactus Habitat (miles)	0	0	0	0	0	2.20	0	0	0	0	0	0	0	0	0	0	2.67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.69	1.05	0	
Length Crossing Fawning Habitat (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Length Crossing New Mexico T&E Habitat (miles)																																			
Length Crossing Colorado T&E Habitat (miles)																																			
Length Crossing Federal T&E Habitat (miles)																																			
Number of Raptor Nests Within 1/4 mile of Centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.00	0	0	0	0	0	0	0	0	0	0	1.00	0	0	0	0
Length Crossing Raptor Forage Areas (miles)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Number of Bald Eagle Nests Within 1/2 mile of Centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Soil Erodibility																																			
Length Crossing Low Soil Erodibility Potential (miles)	3.77	2.18	0	2.72	0.36	2.11	0.36	2.38	1.38	0.18	0.05	0	1.08	0.96	0.26	0	2.84	0	0	1.29	0.05	0.37	1.24	4.27	8.08	3.35	5.73	2.74	2.42	0.53	0	1.57	1.44	5.59	
Length Crossing Moderate Soil Erodibility Potential (miles)	0	0	2.72	0.40	0	3.31	2.67	3.61	0.73	0.97	0	0	0.33	3.93	0	0	0	0	0	2.62	3.81	2.57	0	0.71	1.44	0.30	0.72	0.20	0	0.31	0	1.19	1.06	9.20	
Length Crossing High Soil Erodibility Potential (miles)	1.72	2.92	0.12	1.58	0	0.41	1.25	0.15	2.38	0.44	1.08	0	0.25	3.97	4.10	1.65	1.97	1.19	1.97	1.41	0	0	0	0	0	0	0	0	2.78	1.58	0	0.57	0.68	2.22	
CULTURAL RESOURCES																																			
Cultural Resources																																			
Number of NRHP-listed Sites Within 1/4 mile of Route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Number of Previously Recorded Colorado Sites Within 75 ft of Route	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00	2.00	1.00	0	1.00	0	0	0	0	0	0	
Number of Previously Recorded New Mexico Sites Crossed by Route	0	2.00	0	4.00	0	6.00	0	0	1.00	0	0	0	0	0	0	2.00	1.00	2.00	0	8.00	0	0	0	0	0	0	0	0	2.00	0	0	0	0	3.00	
Length Crossed With No Class III Survey Coverage (miles)	0.68	0.20	0.00	0.33	0.04	0.41	0	0.03	0.06	0	0.08	0	0.06	0.59	0.17	0	0.13	0	0	0.02	0	0	0	0	0	0	0	0	0.23	0.09	0	0.16	0.18	0.02	

Appendix E: Comparative Route Matrix

San Juan Basin Energy Connect
Route Refinement Report

This page intentionally left blank.

Appendix E—Comparative Route Matrix

Route Alternatives	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
ENGINEERING						
Overall Length (miles)	67.71	68.59	64.52	65.41	66.76	67.65
Low Best	5	6	1	2	3	4
Number of Transmission Line Crossings	6.00	6.00	5.00	5.00	7.00	7.00
Low Best	3	3	1	1	5	5
Number of Railroad Crossings	0.00	0.00	0.00	0.00	0.00	0.00
Low Best	1	1	1	1	1	1
Number of Road Crossings	107.00	101.00	98.00	92.00	100.00	94.00
Low Best	6	5	3	1	4	2
Length Adjacent to (within 200 ft) State Highways (miles)	0.07	0.07	0.15	0.15	0.15	0.15
Length Adjacent to (within 200 ft) U.S. Highways (miles)	0.07	0.07	0.07	0.07	0.07	0.07
Length Adjacent to (within 200 ft) County and Local Roads (miles)	16.99	14.09	14.31	11.41	13.16	10.26
Length Adjacent to (within 200 ft) Existing Railroads (miles)	0.07	0.07	0.07	0.07	0.00	0.00
Length Adjacent to (within 200 ft) Existing Parcel Boundaries (miles)	20.39	18.62	19.78	18.01	18.82	17.05
High Best	1	4	2	5	3	6
Length Adjacent to (within 200 ft) Existing Transmission Line (miles)	15.99	15.99	28.48	28.48	24.49	24.49
Length Adjacent to (within 200 ft) Existing Gas Pipelines (miles)	13.80	11.72	11.15	9.07	9.03	6.95
Length Adjacent to (within 700 ft) Existing Gas Pipelines (miles)	14.68	19.28	5.52	10.12	5.29	9.89
Total Segment Length Adjacent to Existing Linear Features (except parcels) (miles) (GL 200 ft)	34.69	31.80	41.19	38.30	36.02	33.14
Adjacency to Existing Linear Features (except parcels) (% of Overall Length) (GL 200 ft)	51.23%	46.35%	63.84%	58.55%	53.96%	48.98%

Appendix E—Comparative Route Matrix

Route Alternatives	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Total Segment Length Adjacent to Existing Linear Features (except parcels) (miles) (GL 700 ft)	42.93	44.48	44.22	45.76	39.13	40.67
Adjacency to Existing Linear Features (except parcels) (% of Overall Length) (GL 700 ft)	63.40%	64.83%	68.53%	69.95%	58.61%	60.11%
High Best	4	3	2	1	6	5
Total Segment Length Adjacent to Existing Linear Features (including parcels/700 ft pipelines (miles)	49.72	40.96	41.00	39.91	30.67	54.38
Adjacency to Existing Linear Features (% of Overall Length)	73.42%	59.70%	63.53%	61.01%	45.93%	80.39%
Length Crossing Slope <10% (miles)	55.35	54.57	53.15	52.36	60.13	59.35
Length Crossing Slope 10–25% (miles)	7.80	9.06	7.06	8.31	4.44	5.70
Length Crossing Slope >25% (miles)	2.47	2.77	2.30	2.60	0.96	1.26
Total Score	20.00	22.00	10.00	11.00	22.00	23.00
Overall Engineering Rank	3	4	1	2	4	6
LAND USE FACTORS						
Jurisdiction						
Length Crossing BLM-managed land (miles)	22.61	22.61	25.88	25.88	35.60	35.60
High Best	5	5	3	3	1	1
Length Crossing BLM-managed SDA's or ACECs (miles)	16.66	16.66	11.48	11.48	26.29	26.29
Low Best	3	3	1	1	5	5
Length Crossing Southern Ute Indian Reservation (miles)	13.09	14.46	13.09	14.46	7.03	8.41
Low Best	3	5	3	5	1	2
Length Crossing State-managed Land in New Mexico (miles)	3.02	3.02	3.95	3.95	3.78	3.78
Low Best	1	1	5	5	3	3
Length Crossing Private Land (miles)	28.99	28.50	21.59	21.10	20.34	19.86
Low Best	6	5	4	3	2	1
Subtotal Score	18	19	16	17	12	12

Appendix E—Comparative Route Matrix

Route Alternatives	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Land Cover						
Length Crossing Open Water (miles)	0.00	0.00	0.00	0.00	0.05	0.05
Low Best	1	1	1	1	5	5
Length Crossing Developed, Open Space (miles)	0.33	0.42	0.07	0.17	0.10	0.20
Low Best	5	6	1	3	2	4
Length Crossing Developed, Low Intensity (miles)	1.13	0.24	1.17	0.28	1.17	0.28
Low Best	4	1	6	3	5	2
Length Crossing Developed, Medium Intensity (miles)	0.14	0.14	0.14	0.14	0.14	0.14
Low Best	1	1	1	1	1	1
Length Crossing Developed, High Intensity (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Low Best						
Length Crossing Barren Land (miles)	1.58	1.58	0.56	0.56	0.56	0.56
High Best	1	1	3	3	3	3
Length Crossing Deciduous Forest (miles)	0.53	0.63	0.53	0.63	0.49	0.59
Low Best	2	5	2	5	1	4
Length Crossing Evergreen Forest (miles)	13.30	14.72	13.12	14.54	6.64	8.06
Low Best	4	6	3	5	1	2
Length Crossing Mixed Forest (miles)	0	0	0	0	0	0
Length Crossing Shrub/Scrub (miles)	41.59	40.60	39.99	38.99	43.42	42.42
High Best	3	4	5	6	1	2
Length Crossing Grassland/Herbaceous (miles)	7.72	7.80	7.54	7.62	11.64	11.72
High Best	4	3	6	5	2	1
Length Crossing Pasture/Hay (miles)	0.86	1.96	1.12	2.22	1.62	2.73
High Best	6	3	5	2	4	1
Length Crossing Cultivated Crops (miles)	0.10	0.10	0.00	0.00	0.35	0.35
Low Best	3	3	1	1	5	5
Length Crossing Woody Wetlands (miles)	0.43	0.41	0.28	0.26	0.58	0.55
Low Best	4	3	2	1	6	5
Length Crossing Emergent Herbaceous Wetlands (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Low Best						
Length Crossing Prime Farmland, If Irrigated (miles)	6.05	7.25	1.25	2.44	1.35	2.55
Low Best	5	6	1	3	2	4
Length Crossing Farmland of Statewide Importance (miles)	0.56	0.56	1.91	1.91	3.42	3.42

Appendix E—Comparative Route Matrix

Route Alternatives	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Low Best	1	1	3	3	5	5
Length Crossing Prime Farmland, If Irrigated and Drained (miles)	0.05	0.00	0.05	0.00	0.05	0.00
Length Crossing Prime Farmland, If Irrigated and Protected From Flooding or Not Frequently Flooded During Irrigation Season (miles)	0	0	0	0	0	0
Subtotal Score	44	44	40	42	43	44
Residences						
Residences Within 75 ft of Centerline	0.00	0.00	0.00	0.00	0.00	0.00
Residences Within 75-150 ft of Centerline	0.00	0.00	0.00	0.00	0.00	0.00
Residences Within 150ft-300 ft of Centerline	5.00	1.00	5.00	1.00	4.00	0.00
Total Residences Within 300 ft of Centerline	5.00	1.00	5.00	1.00	4.00	0.00
Low Best	5	2	5	2	4	1
Other Structures Within 300 ft of Centerline	8.00	5.00	8.00	5.00	6.00	3.00
Number of Parcels Within 75 ft of Centerline	120.00	114.00	108.00	102.00	116.00	110.00
Residences within 1/4 mile of Centerline	61.00	35.00	64.00	38.00	132.00	106.00
Low Best	3	1	4	2	6	5
Length Crossing Subdivisions	0.52	0.41	0.12	0.00	0.12	0.00
Number of Subdivisions Crossed by Centerline	2.00	1.00	1.00	0.00	1.00	0.00
Subtotal Score	8.00	3.00	9.00	4.00	10.00	6.00
Other Land Use Factors						
Number of Center Pivots Crossed by Centerline	0.00	0.00	0.00	0.00	0.00	0.00
Number of Oil or Gas Wells Within 250 ft of Centerline	15.00	15.00	15.00	15.00	14.00	14.00
Low Best	3	3	3	3	1	1

Appendix E—Comparative Route Matrix

Route Alternatives	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length Crossing Surface Mines (miles)	4.68	4.68	2.31	2.31	2.31	2.31
Low Best	5	5	1	1	1	1
Number of Surface Mines Crossed by Centerline	2.00	2.00	1.00	1.00	1.00	1.00
Length Crossing Areas With High Subsidence Probability (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing Ash Disposal Areas (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing Mining Hazard Areas (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Number of Schools Within 300 ft of Centerline	0.00	0.00	0.00	0.00	0.00	0.00
Number of Communication Towers Within 0.25 mile of Centerline	22.00	22.00	35.00	35.00	27.00	27.00
Low Best	1	1	5	5	3	3
Number of Public Parks and Outdoor Recreation Areas Crossed by Centerline	0.00	0.00	0.00	0.00	0.00	0.00
Number of Public Airports or Heliports Within 1 mile of Centerline	1.00	0.00	1.00	0.00	1.00	0.00
Low Best	4	1	4	1	4	1
Subtotal Score	13	10	13	10	9	6
Visual Resources						
Length crossing Class I and Class II VRM	9.40	9.40	2.80	2.80	2.80	2.80
Low Best	5	5	1	1	1	1
Length Parelleling (within 1/4 mile) Scenic Byways (miles)	0.00	0.00	0.00	0.00	0.47	0.47
Number of Scenic Byway Crossings	0.00	0.00	0.00	0.00	1.00	1.00
Low Best	1	1	1	1	5	5
Subtotal Score	6	6	2	2	6	6
Total Score	89.00	82.00	80.00	75.00	80.00	74.00
Overall Land Use Factors Rank	6	5	3	2	3	1

Appendix E—Comparative Route Matrix

Route Alternatives	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
ENVIRONMENTAL FACTORS						
Water Resources						
Number of Perennial or Intermittent Stream/River Crossings	90.00	92.00	101.00	103.00	106.00	108.00
Low Best	1	2	3	4	5	6
Number of Perennial Stream/River Crossings Wider Than 1000 ft	0.00	0.00	0.00	0.00	0.00	0.00
Number of Canal or Ditch Crossings	10.00	10.00	4.00	4.00	4.00	4.00
Low Best	5	5	1	1	1	1
Length Crossing NWI Wetlands (miles)	0.04	0.04	0.04	0.04	0.15	0.15
Low Best	3	3	1	1	5	5
Length Crossing 100-year Floodplain (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal Score	9	10	5	6	11	12
Biological Resources						
Length Crossing Mule Deer Severe Winter Range (miles)	8.38	7.00	8.38	7.00	7.95	6.57
Low Best	5	2	5	2	4	1
Length Crossing Mule Deer Concentration Area (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing Mule Deer Winter Concentration (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing Elk Severe Winter Range (miles)	8.09	8.04	8.09	8.04	6.63	6.58
Low Best	5	3	5	3	2	1
Length Crossing Bighorn Sheep Winter Concentration Areas (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing Elk Production Areas (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing Prairie Dog Habitat (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing Raptor Habitat (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing Greenback Cutthroat Streams (miles)	0.00	0.00	0.00	0.00	0.00	0.00

Appendix E—Comparative Route Matrix

Route Alternatives	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length Crossing Pike Minnow and Razorback Sucker Habitat (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing Aztec Gilia and Bracks Cactus Habitat (miles)	0.00	0.00	2.20	2.20	6.56	6.56
Low Best	1	1	3	3	5	5
Length Crossing Fawning Habitat (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing New Mexico T&E Habitat (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing Colorado T&E Habitat (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Length Crossing Federal T&E Habitat (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Number of Raptor Nests Within 1/4 mile of Centerline	3.00	3.00	2.00	2.00	0.00	0.00
Low Best	5	5	3	3	1	1
Length Crossing Raptor Forage Areas (miles)	0.00	0.00	0.00	0.00	0.00	0.00
Number of Bald Eagle Nests Within 1/2 mile of Centerline	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal Score	11.00	9.00	11.00	9.00	8.00	7.00
Soil Erodibility						
Length Crossing Low Soil Erodibility Potential (miles)	26.66	27.11	26.39	26.85	34.25	34.71
Length Crossing Moderate Soil Erodibility Potential (miles)	19.41	19.84	14.63	15.07	16.35	16.79
Length Crossing High Soil Erodibility Potential (miles)	18.43	18.43	20.27	20.27	14.97	14.97
Low Best	3	3	5	5	1	1
Subtotal Score	3.00	3.00	5.00	5.00	1.00	1.00
Total Score	23.00	22.00	21.00	20.00	20.00	20.00
Overall Environmental Factors Rank	6	5	4	1	1	1

Appendix E—Comparative Route Matrix

Route Alternatives	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
CULTURAL RESOURCES						
Cultural Resources						
Number of NRHP-listed Sites Within 1/4 mile of Route	0.00	0.00	0.00	0.00	0.00	0.00
Number of Previously Recorded Colorado Sites Crossed by Route	3.00	3.00	3.00	3.00	3.00	3.00
Low Best	1	1	1	1	1	1
Number of Previously Recorded New Mexico Sites Crossed by Route	18.00	18.00	25.00	25.00	17.00	17.00
Low Best	3	3	5	5	1	1
Length Crossed With No Class III Survey Coverage (miles)	2.02	2.02	2.03	2.03	2.20	2.20
Total Score	4	4	6	6	2	2
Overall Cultural Resources Rank	3	3	5	5	1	1
OVERALL SCORE	136	130	117	112	124	119
OVERALL RANK	6	5	2	1	4	3



TETRA TECH